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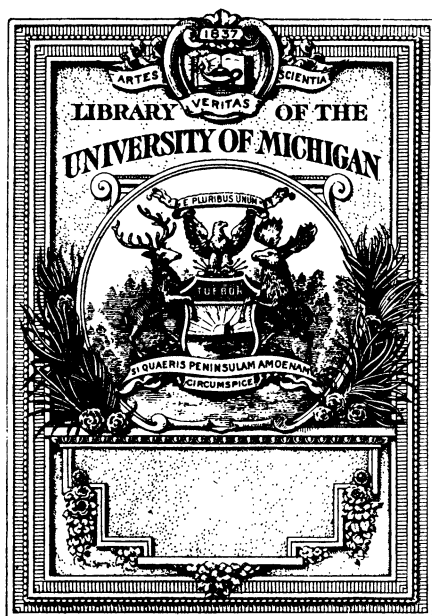
PHILIPPINE  
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# THE PHILIPPINE JOURNAL OF SCIENCE

ALVIN J. COX, M. A., Ph. D.  
GENERAL EDITOR

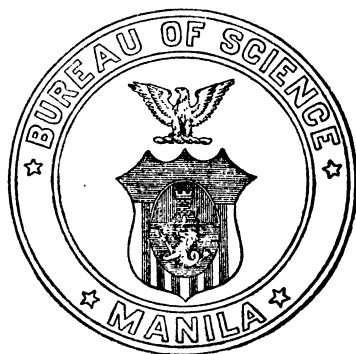
## SECTION D GENERAL BIOLOGY, ETHNOLOGY, AND ANTHROPOLOGY

EDITED WITH THE COÖPERATION OF

M. L. MILLER, Ph. D.; R. P. COWLES, Ph. D.; C. S. BANKS, M. S.  
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VOLUME IX  
1914

WITH 56 PLATES, AND 45 TEXT FIGURES



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# THE PHILIPPINE JOURNAL OF SCIENCE

D. GENERAL BIOLOGY, ETHNOLOGY,  
AND ANTHROPOLOGY

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VOL. IX

FEBRUARY, 1914

No. 1

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## PRESERVATION OF COMMERCIAL FISH AND FISHERY PRODUCTS IN THE TROPICS

By ALVIN SEALE

*(From the Section of Ichthyology, Biological Laboratory, Bureau of  
Science, Manila, P. I.)*

Two plates

### PRESERVING BY DRYING AND SALTING

Almost every country has its own methods for drying and salting fish due to local conditions.

In the provinces of the Philippine Islands almost all of the fish for home consumption are simply sundried with but a sprinkling of salt or without salt. This economy of salt is probably due to the difficulty of securing it and to the fact that the fish are not to be kept for a great length of time. However, in some places, like Sitanki Island, where the salting of fish is the most important industry and the work is chiefly in the hands of Chinese, the following method is employed: The fish are caught by the Moro fishermen who clean them promptly, usually while still on the fishing ground. The fish is placed in front of the operator with the belly uppermost and the head inward; a cut is made along the side of the backbone from the base of the tail to near the head. The fish is then turned over, and a similar cut is made on the other side of the backbone to the tip of the snout, the skin on the belly alone remaining intact. The fish is then opened by cutting the upper or head end of the

backbone and the posterior end of the body cavity. This enables the operator to spread the fish out flat in three united sections, the backbone constituting one section. If the fish is very large, two gashes are cut in the thickest part of the flesh on each side so that the salt may penetrate more quickly. The entrails are then removed. The entire operation requires less than half a minute by an experienced Moro using a bolo. The fish are then sold to Chinese, who place them at once in a large vat of brine sufficiently strong to float a potato. About 1 sack of salt to 3 picules of fish (418.5 pounds) is used, but this brine is too weak. The fish are usually left in these vats for three or four days; then they are placed on platforms to dry; each evening, or when rain threatens, they are gathered up and piled in kenches. This process is continued until they are thoroughly dry and ready for the market. Dried fish from Sitanki are said to spoil very readily. I believe this to be chiefly due to the lack of care in keeping the brine sufficiently strong and the vat sanitary.

In Manila, where a very large quantity of small fish is cured, especially sardines and young herring, the process is as follows: The fish are washed in sea water when they are removed from the boat, placed in strong brine for from two to three hours, and spread on flakes until thoroughly sundried (Plate I). They are then ready for packing and shipping. These fish are dried in the round, and are covered each night and during showers. Owing to the fact that frequently fish of from 20 to 22 centimeters were included in the lot, they were not cured properly. Consequently, a city ordinance was passed requiring the evisceration of fish of more than 15 centimeters in length, when they were to be sundried. This was purely a sanitary measure.

During the dry months in the Philippines, it is much better to depend upon sundrying with a minimum amount of salting for preserving fish. On the Grand Banks of the Newfoundland coast, the fish are stored in kenches on shipboard. About 11.4 hectoliters (1.5 bushels) of salt for 45.30 kilograms (100 pounds) of fish are used for these. When the fishermen reach the shore, however, they cure the fish by pickling or by a combination of drying and pickling.

#### PICKLING

In pickling fish it is customary to use either a rectangular trough or a large hogshead which will hold about 193.05 liters (51 gallons). This is called a butt. A thick layer of salt is sprinkled on the bottom of the butt, then the fish are placed in



the butts in layers, the split surface up. Salt is sprinkled over each layer so that all parts of the fish are well covered, and a half bushel of salt is placed on top to make a strong pickle. The amount of salt required for each hogshead is from 1.4 to 2.5 hectoliters (4 to 6 bushels). When the fish settle, they are covered with strong brine, and in this condition they will keep until needed.

When the fish are taken from the butts, they are carefully stacked in piles from 0.9 to 1.2 meters (3 to 4 feet) high called *kenches*. This is to allow the brine to drain off. With the exception of the lower layer, they are stacked with the cut side down. At the end of from twenty-four to forty-eight hours they are put out to dry on bamboo racks about a meter from the ground, being spread cut side up. After one day of drying they are repiled or *kenched* for from twenty-four to forty-eight hours and then dried again for two days or until perfectly dry. I strongly advise that they then be packed in large cooking bags or oilpaper, made up into neat packages, and stored in a dry place. Fish prepared in this manner will keep in good condition in the Philippines for months.

Regarding the quantity of salt used in curing iced or fresh fish in the United States, A. W. Bitting writes:<sup>1</sup>

About half a pound of salt is used to the pound of iced fish in the regular course of curing the full salted fish; for export fish about three-eighths of a pound is used, and for slack salted one-fourth of a pound. As the cured fish contains only from 14 to 20 per cent of salt, it is evident that about 33 per cent of the amount used serves as a preservative while the remainder acts as a drying agent, and it would seem that improved methods might effect a marked saving in this part of the process, \* \* \* sufficient drying and retention of that dryness under varying weather conditions will assist in preventing spoilage.

It is in this connection that we urge the use of oilpaper or large cooking bags for packing fish, as this tends to prevent the entrance of dampness which would cause the fish to mold—and this is the greatest difficulty we have to contend with in preserving dried fish in the Philippines.

#### SALTED SHRIMPS OR PRAWNS

At certain times of the year very young prawns from 2 to 3 centimeters in length are sold in the Manila markets. These are preserved by being mixed with a liberal quantity of coarse salt and then placed in kerosene tins. They find a ready sale.

<sup>1</sup> *Bull. U. S. Dept. Agr., Bur. Chem.* (1911), 133, 27, 29.

## SALTED CRABS

During the rainy season, great quantities of small crabs are caught in the brackish waters of the esteros near Manila. They are usually lightly sprinkled with salt and offered for sale the next morning in the Manila markets. This crab, *Varuna literata* (Fabr.), is apparently not taken in large numbers at any other season.

## MULLET ROES

There are at least 16 species of mullets or *banak* found in Philippine waters. They are good food fishes and usually abundant in all parts of the Islands. Several thousands have been caught at one haul of a big seine. The roes of these fish are a great delicacy, but I am not aware that they are conserved in any manner in the Philippines. The following is an abstract of one method <sup>2</sup> for preparing mullet roes:

The fish are split open and the roes removed, care being taken to avoid breaking the roe bags or bruising the eggs. They should be separated carefully from the surrounding viscera. The roes are placed in tubs with holes in the bottom so that the water can run off. The roes, still in the roe bags, are then placed in boxes or kegs with fine salt sprinkled over and between them. An excess of salt must be avoided as it will cause the egg sacs to break. About 1 peck of Liverpool, or any fine, salt should be used to 160 pounds of eggs.

On removal from the salt, the roes are spread on boards and exposed to the sun for about one week, being covered at night. They are turned over each morning and protected from rain. Sometimes, after one day's exposure, other boards are laid on top of the roes to compress them slightly. When properly cured they are from 4 to 8 inches long, from 2 to 4 inches wide, and from one-half to two-thirds of an inch thick. They vary in color from yellowish to dark red. These are now ready to be packed in small boxes and marketed.

In Italy the hard roes of mullet are converted into cakes termed *bolarge* or *bolargo*, which are prepared by washing and sprinkling with salt and pressing between two boards. They are then smoked or sundried, and are a good appetizer in that they promote thirst. In India these roes are considered excellent for curries.

## BAGOONG

Bagoong is the most common fish preparation in the Philippines. In almost every native home it is more or less of a staple. It is prepared by mixing 2 parts of young or small fish—anchovies

<sup>2</sup> Bull. U. S. Fish Comm. (1898), 18, 546.

preferred—with 3 parts of salt. This is placed in stone jars, covered to exclude flies and dirt, and allowed to ferment for one month. It is then ready for use, the liquid portion being used as a sauce and the solid fried or mixed with rice. Care should be taken to prevent flies from depositing their eggs in this mixture as otherwise it becomes filled with larvæ and is most unappetizing. However, it is sometimes eaten in this condition.

#### PRESERVING BY SMOKING

In its simplest form, the preservation of fish by smoking is as follows: The fish are first dressed. If large, they are split down the belly from head to tail so that they lie flat. The head and most of the backbone are removed. Usually the flesh is gashed in several places to allow the salt to penetrate. The fish are next placed in vats or barrels with 22.66 kilograms (50 pounds) of No. 2 salt and from 2.27 to 4.54 kilograms (5 to 10 pounds) of granulated sugar to 91 kilograms (200 pounds) of fish. On the second day, brine made by dissolving 13.61 kilograms (30 pounds) of salt in 18.9 liters (5 gallons) of water is added. After the fifth or sixth day, the fish are removed and soaked in fresh water for three hours. They are trussed out flat, hung on sticks or bamboos, and permitted to dry for from two to three hours in the open air. They are then hung in the upper part of the smokehouse away from the heat, but not so high as to be in the hot air which accumulates at the top. The smoking is continued for from eighteen to thirty-six hours, twenty-four of which are usually required to complete the process. When low smokehouses are used, in which the fish are hung within from 2.5 to 3 meters (8 to 10 feet) of the fire, the smoking is usually completed in less time than this. The smoke must be even throughout and with little fire. When sufficiently smoked, the fish are permitted to cool and are then packed with paper wrapped about them. The price in the United States for fish prepared in this way is usually from 36 to 40 centavos per pound.

The smokehouse may be of almost any shape or size, from an inverted barrel to the elaborate brick house with outside furnaces. A common form is one with three or four chambers, ranged side by side, from 1.83 to 4.27 meters (6 to 14 feet) high, 1.22 to 1.52 meters (4 to 5 feet) wide, and 1.83 to 3.66 meters (6 to 12 feet) deep. Hardwood or hardwood sawdust is used for producing the smoke.

Variations from the above method are innumerable, and depend largely upon the variety of smoked product to be prepared, and the size and variety of the fish to be smoked must be taken into consideration.

For the smoking of small fish such as young herring or sardines, the Chinese of Manila have very extensive smokehouses and drying yards, and a large business is carried on by them. This business has increased wonderfully within the past six years. In 1909 there were but 14 houses and yards for drying and smoking fish; in 1911 I counted 36 such establishments all owned by Chinese, who were preparing the fish, not only for local consumption, but for export to China as well. In 1912 almost all of these establishments were destroyed in the great Tondo fire, but at this date (1913) many have resumed operations.

The method of their operation, which is effective and economical although rather crude, is as follows: The fish—usually herring or sardines—are landed at Tondo beach (Plate I). They are dipped in salt water and washed, but not eviscerated. They are then put in strong brine for from two to three hours (very small or young fish for less time) and then dipped in boiling water for a few moments (Plate II). For the latter purpose, large kettles over a crude earthen furnace are used. The fish are then drained and spread in the sun for about one hour to dry (Plate I). They are next placed in round baskets about 40 centimeters in diameter, 100 fish to the basket (Plate II). These baskets are placed over one of the openings in the furnace to smoke. The furnace (Plate II) is usually constructed of stone or cement, and is about 1 meter high and 1 meter wide, while the length usually is limited only by the length of the house. There may be two or more rows of these furnaces in each house. The furnaces are supplied with holes in the top about 50 centimeters apart for the smoke to pass out; otherwise they are entirely closed. A smoke of hardwood sawdust is started, and the basket of fish is placed over one of the holes of which there are from 5 to 40 in each furnace. Usually several baskets are placed one above another, and over the top basket is always placed a tightly woven basket cover (Plate II). After smoking for ten hours the lowest basket is shifted to the top and the smoking is continued until the fish are properly cured. The length of time necessary for this process depends largely upon the size of the fish. The fish intended for sale in the local markets are usually smoked for twenty-four hours. Small

fish require less smoking, export fish more. These baskets retail for 60 centavos each.

If the fish are placed at a distance from the fire so that the temperature is never above 26°.7 C., the product is called "cold smoked," but if the fish are hung very near the fire and are more or less cooked it is called "hot smoked." The latter method requires only about two hours, but the product will keep but a very short time.

The "cold smoked" is the better product. The smoking may last from a few hours to two or three weeks, depending upon the product desired. Hardwood or hardwood sawdust makes the best smoke, but I have succeeded in making a very good product by using half-dry and green coconut husks.

I have conducted a number of experiments in smoking fish, using the following, all of which are very common in the Philippines: Barracuda, sea bass, mullets, cavalla, snappers, and porgies. The fish were thoroughly cleaned and washed, and the backbones removed. Some of the larger ones were cut in strips. They were put in strong brine for one day, allowed to drain and dry two days in the sun and wind, and then transferred to the smokehouse and smoked slowly for fourteen days, after which they were placed in the sun for half a day. Finally, they were wrapped in oilpaper and were sealed in tin boxes. After nine months in Manila, these fish were eaten and pronounced excellent.

A very appetizing fish product was made by cutting the flesh of large fish in rather small strips, which were placed in brine for one hour and transferred to spiced vinegar for three days, then sundried and slow smoked nine days. When wrapped in oilpaper and packed in tin boxes, these kept in good condition in Manila for four months. The following is an abstract of a method which the United States Bureau of Fisheries<sup>3</sup> recommends for preparing a choice fish product for warm climates:

The fish, after being smoked, are cooled and placed in layers in wooden barrels. Between each layer of fish a layer of dry salt is placed in the proportion of about 6 pounds of salt to 100 pounds of fish. The barrels, after being filled, are kept in a cool place until the fish have become completely hard, which will require from three to fifteen days, depending upon the kind and size of the fish. The barrels are then filled with brine and closed by a tight-fitting cover. The brine must be carefully prepared in the following manner: Filtered water is boiled with salt to a saturated solution, cooled, skimmed, and as much drawn off as appears fully clear and fine. If the brine is not carefully prepared, the fish will not keep for

<sup>3</sup> *Bull. U. S. Fish. Comm.* (1898), 18, 477.

any length of time, which will likewise be the case if the process of hardening has not completely taken place.

Fish prepared in this manner will keep for many months and can be sent to hot climates without danger of spoiling.

#### SMOKED HERRING

The ordinary hard-smoked herring is prepared by pickling it in a tank of about 842 liters' (225 gallons') capacity. This tank is first partially filled with weak pickle made by adding 0.53 hectoliter (1.5 bushels) of salt to 100 gallons of water. From about 379 to 568 liters (100 to 150 gallons) of fish are then placed in the pickle, after which half a bushel of salt is put over them, and a third more of the fish is added. A second layer of salt, about 0.53 hectoliter (1.5 bushels), is laid on, and enough fish are then added to fill the tank which is finally covered with from 1.06 to 1.8 hectoliters (3 to 5 bushels) of salt. Each tank when filled contains 4 hogsheads of fish and from 2.11 to 3.17 hectoliters (3 to 5 bushels) of salt, the quantity of salt depending upon the size of the fish and the condition of the weather.

When the salt has struck, the time for which will require from twelve to forty-eight hours depending upon the size of the fish, the fish are dipped out and strung on sticks. They are then dipped in a trough of clean salt water and allowed to drain and dry for about one hour, after which they are hung in the smokehouse and the fires are started. The fish are smoked from three to five weeks. The sticks should be shifted so that a regular smoking is insured. It is best to fill the smokehouse gradually.

#### BLOATERS

The following is an abstract<sup>4</sup> of the method of preparing the popular fish product known as bloater.

Fresh herring are used and are pickled as soon as received, 1 bushel of salt being used to 1 barrel of fish. After remaining in the pickle for from two to three days they are removed, drained, and placed on sticks for smoking. In order to "bloat," the herring must be thoroughly moist. After they have commenced to dry in the smokehouse, the heat must be increased. If they hang for from ten to twelve hours without heat, they will not "bloat." The smoking continues for from two and one-half to six days, when the fish are usually sufficiently cured. Bloaters will keep but a short time, unless put in cold storage.

#### KIPPERED HERRING

To kipper herring, the fish are cleaned and salted like the bloaters, except that they are not kept in pickle so long. They

<sup>4</sup> *Bull. U. S. Fish Comm.* (1898), 18, 485.

are then hung up to dry for a few hours and smoked for from six to eight hours at temperatures of from 26°.7 to 29°.4 C., the fish being hung in such a way as to keep the abdomen open. They are then ready for cooling and packing.

"Kippered herring differ from bloater herring principally in that they are split and eviscerated before smoking." These will not keep well in the Philippines unless put in cold storage.

#### SMOKED CAT FISH

Cat fish may be smoked in the same manner as herring. However, if they are very large, they should first be cut into strips.

#### SMOKED EELS

The following is an abstract of a method used in Germany for smoking eels, from the United States Bureau of Fisheries:<sup>5</sup>

The head, skin, tail, and viscera are removed, and the eel is split open the entire length, the backbone and many of the smaller bones attached to it are removed. It is then laid in strong salt brine for six hours and is then wiped dry with a towel and covered with the following preparation which has been pounded in a porcelain mortar: One large anchovy, 1 ounce fine salt, 8 ounces of sugar, 1 ounce saltpeter, and sufficient butter to make a paste of the ingredients. The eel, thoroughly cured with this preparation, is rolled up tightly in the form of a disk, beginning at the tail end, tied with a cord to hold it in position, and then sewed up in a linen cloth, which covers the disk and allows the end to project. These disks are next suspended in an ordinary smokehouse and smoked for from five to six days, then allowed to cool and become firm, when they are ready for the table.

#### MARINATING FISH

The method of conserving fish in spiced vinegar known in Europe as marinating has never been practiced to any extent in the Philippines. However, I believe that fish put up in this manner would meet with a favorable reception from consumers. For this purpose young herring, sardines, or anchovies are most desirable, although almost any small food fish may be used. Good firm fish, however, should be selected. The fish should be cleaned, washed, and dried for from half an hour to one hour in the air, then boiled or fried in hot oil (in Italy they are dipped in flour before frying), and put out to cool and to let the oil drain off. They are then packed in barrels, kegs, or glass jars, and spiced vinegar sufficient to fill the containers is poured in. After allowing them to stand a short time, the

<sup>5</sup> Bull. U. S. Fish Comm. (1898), 18, 505.

bung is driven in or the cans sealed up. An excellent account of the method of marinating eels as practiced in Italy is given by James Hornell.<sup>6</sup>

#### CANNING SARDINES AND OTHER FISHES IN THE PHILIPPINES

I believe that there is a good opening for a moderate amount of capital in the canned fish industry in the Philippines. This is especially true if the fish cannery is operated in conjunction with some allied industry; for instance, a tomato-catsup factory. These two could easily be combined. Excellent tomatoes are grown in the vicinity of Manila, and a good market would stimulate additional planting. Oriental people prefer sardines put up in tomato sauce, so a portion of the output could be used for that purpose. The refuse of the fish cannery could readily be ground and pressed for chicken feed or fertilizer. Therefore, in a properly organized cannery there would be three products to put on the market—sardines, tomato catsup, and “bone meal” or fertilizer. Satisfactory labor at a reasonable rate could be readily secured. Taking into consideration the large quantities of fresh sardines landed each morning at Tondo beach, it is surprising that some local capitalist has not opened a cannery.

In brief outline, the method of preparing sardines is as follows:

Catch the fish.

Rinse the fish well in salt or fresh water.

Spread on tables or a clean floor and sprinkle with a little salt.

Clean by removing heads and entrails.

Place the fish in brine of sufficient strength to float a potato, where they should remain until the salt “strikes in.” This will take from one-half to one hour.

Rinse rapidly in two waters to remove scales, dirt, and excess of salt.

Dry in the open air by placing the fish, tails up, in shallow wire baskets, so that water will run out of the abdominal cavity. In good weather one hour or even less is sufficient for drying. In bad weather, dry indoors. The wire baskets full of fish should be hung up so the air may circulate freely through them.

Cook the fish in oil by immersing these wire baskets with the fish in them in boiling peanut or olive oil. They should remain in the oil about two minutes or until the tail fin breaks easily.

Hang up the baskets so that the oil will drain off, and leave until the fish are cool.

Pack the fish in tins.

Fill the packed tins with olive oil, tomato catsup, or whatever is desired; a few cloves, small peppers, or thyme may be used.

Solder or clamp the covers so that they are absolutely air-tight.

<sup>6</sup> *Bull. Madras Fisheries Bureau* (1911), 2, No. 6, 50.



Immerse the cans of fish in boiling water for two hours. This cooks the fish and softens the bones.

Remove the cans from the water, allow them to cool, and rub them in dry sawdust to remove all oil from the outside.

The sardines are then ready for the market.

Using the above method, I prepared 100 tins of Philippine sardines to be used as an exhibit and afterward to be sent to various packing associations in order to interest them in the subject. The letters received in reply to these samples of sardines were in most cases very satisfactory. Owing to imperfect soldering, the oil leaked from some of the tins and the contents spoiled.

Dr. David Starr Jordan, president of Stanford University, wrote:

I had the can of the Philippine sardines you sent me served at the table. I consider them equal to the European sardines.

A member of the firm of Messrs. Castle Bros.-Wolf & Son, one of the largest commercial houses in Manila—now the Pacific Commercial Company—wrote:

I consider the quality of the sardines you sent us very good and see no reason why, eventually, the canning of these fish should not be an important industry.

According to the decision of the pure food experts of the United States Bureau of Agriculture, any small clupeoid fish may be put up in oil and labelled sardine, provided that the name of the country where the fish were caught and the kind of oil used in the tins are printed on the label.

This practically includes the entire family Clupeidæ. The following species of this family are found in Philippine waters, several of them in great abundance.

*Species of clupeoid fishes found in Philippine waters.*

<i>Stolephorus gracilis</i> (Temm. and Schleg.).	<i>Sardinella gibbosa</i> (Bleeker).
<i>Stolephorus delicatulus</i> (Bennett).	<i>Sardinella sundaica</i> (Bleeker).
<i>Amblygaster sirm</i> (Rüppell).	<i>Sardinella fimbriata</i> (Cuv. and Val.).
<i>Amblygaster clupeoides</i> (Bleeker).	<i>Sardinella longiceps</i> (Cuv. and Val.).
<i>Amblygaster perforatum</i> (Cantor).	<i>Sardinella vancibris</i> (Jordan and Snyder).
<i>Dussumieria acuta</i> Cuv. and Val.	<i>Sardinella melanostica</i> (Schleg.).
<i>Dussumieria elopsoides</i> Bleeker.	<i>Sardinella klunzi</i> (Bleeker).
<i>Dussumieria hasseltii</i> Bleeker.	<i>Sardinella zunazi</i> (Bleeker).
<i>Sardinella moluccensis</i> (Bleeker).	<i>Ilisha hævenii</i> (Bleeker).

There are in addition a large number of anchovies, family Engraulidæ, and a number of fishes of the mackerel family

found in the Philippines that could undoubtedly be canned with profit and sold on their merits.

However simple the process of canning sardines seems to be, I strongly advise against anyone entering the business without first securing the services of an experienced canning operator; otherwise failure would probably result.

In this connection, the following note is of special interest: <sup>7</sup>

The sardine packers of France have of late, as a consequence of the very poor catch in the last few years, decided to close all their factories along the coast of Brittany and Vendée.

This decision is partly due to the poor catch owing to the lack of fish and the antiquated fishing implements used by the Britton fisherman. It is noticed that in past years the fish which abounded along the coast of Brittany seem to have almost disappeared therefrom, or at least the sardine shoals are no longer to be found close to the shore as formerly and seem to be now in the offing. The fishermen being poorly equipped can not go too far off from the coast, and the consequence is that their catch is very trifling. They are unable to supply the factories with a sufficient quantity of fish, and when they secure a good catch try to sell it at very high prices. The manufacturers claim that the Spanish and Portuguese fish caught in large quantities are, on the contrary, sold at very low prices, and thus the Spanish and Portuguese manufacturers are enabled to favorably compete with French manufacturers.

Over 100 factories were closed on January 1, 1913, and many others, it is said, will close before the end of January, 1914. It is also said that several manufacturers will reestablish their works in Spain and Portugal. It is, however, hoped that their decision is not irrevocable, and that if the fishermen are enabled to improve their fishing implements the closed factories may perhaps be reopened before the next fishing season.

The manufacturers' decision affects quite a number of industries, such as tin-can factories, olive-oil manufacturers, etc., and in Brittany alone over 50,000 people will thus be put out of employment. If the matter is not arranged between the canners and the fishermen, French sardines will be very scarce in the markets of the world.

#### PRESERVING FISH BY LOW TEMPERATURE OR REFRIGERATION

The preserving of fish and fish products in the tropics by means of cold is of sufficient importance to merit the most careful scientific observation. The subject is one of primary importance not only to the people of Manila, but also to the inhabitants of every city situated within the tropics and to all transoceanic vessels.

It has no doubt been the experience of almost every one who has traveled by sea that on some vessels all of the fish and frequently the meat and game from the cold storage were as dry as

<sup>7</sup> *Daily Consular & Trade Rep., Washington* (1913), 523.

chips and almost as tasteless, while on others they were all that could be desired.

I venture to state that this difference in the cold-storage foods was due almost entirely to a lack of understanding on the part of the engineer in charge of the refrigeration, a condition entirely inexcusable, considering the amount of information available and the numerous good books that have been published on the subject of cold storage. With the exception of salmon, halibut, and perhaps two or three other species, fish should never be frozen if it can possibly be avoided. A fish that has been fully frozen has a good appearance, and it is only when it is thawed out and cooked that its poor condition is revealed, the flesh being woolly in appearance, dry, and devoid of flavor. This is explained by the fact that fish flesh is largely made up of loosely bound, pale, muscular fibers which rupture very easily when frozen in contrast to the firmly bound red muscles of beef or mutton. Also, fish contain a much larger percentage of water than beef or mutton; therefore, freezing has a more disastrous effect.

Regarding the proper degree of cold at which fish should be kept, there is considerable difference of opinion among experts. The Director of the Insular Cold Storage plant recommends a temperature of  $-9^{\circ}.4$  C. for fish in Manila. The director of the Philippine Cold Stores states as a result of his experience that fish keep nicely in Manila at a temperature of from  $-6^{\circ}.7$  to  $-3^{\circ}.9$  C. This is also the opinion of the manager of the International Cold Stores. On the other hand, Mr. Heron, who has large cold stores and steam trawlers operating for the London trade, says:

I am firmly of the opinion that if fish is required to be kept for a considerable period it must not be frozen, as the tissues cannot stand the freezing as in the case of beef and mutton.

He fully agrees with Anderson<sup>\*</sup> who states in his recommendations to the Fishery Board of Scotland that—

he found that from 0 degrees centigrade to  $-3$  centigrade (32 degrees Fahrenheit to 25.6 degrees Fahrenheit) will prevent the action of most bacteria of putrifaction and at the same time maintain the fish in a condition of rigor, and thus preserve the fish for a considerable time in a comparative fresh condition, and with little deterioration in the tissue.

My own experience indicates that in Manila a round fish with the ordinary market handling, if placed in the refrigerative

<sup>\*</sup> *Proc. Cold Storage & Ice Assoc. England* (1909), 9, 81.

room and kept at a temperature of from  $-0^{\circ}$  to  $-3^{\circ}$  C., will keep for from ten to fourteen days only. If the fish is carefully handled and gutted, the gills removed and the inside wiped with a dry cloth, and the fish wrapped in oilpaper, it will keep in sweet condition and retain its flavor for three weeks.

Herring and mackerel stand freezing better than most other Philippine fishes. Many people who have cold storage, especially Americans, believe the best way to preserve fish is to freeze them, then immerse in water, and refreeze or glaze. This method is extensively used in the Canadian and American fisheries.

There is also a method of freezing fish in ice while they are still alive, using oxygen to reduce the amount of water necessary to be frozen, but this method is still in the experimental stage. It is difficult to predict its future.

For ordinary transportation of fish from the fishing grounds to the market, it is usual for the vessel to carry a cargo of ice in the bins. This should be between decks in the coolest part of the ship and be as well insulated as possible. When the fish are caught, they are cleaned and washed at once. A layer of cracked ice from 7 to 10 centimeters thick is placed on the floor of one of the bins. A layer of fish is placed over this and covered with chiseled ice, grading into cracked ice to the size of a walnut. Alternating layers of fish and ice are put in until the bin is full, when a layer of ice 15 centimeters or more thick is placed over the top. If the room is kept at freezing point, these fish will remain from twelve to fourteen days or longer in sweet condition. If possible, and there need be no great difficulty if the fishing is along shore, the fish should be chilled before they are packed in the above manner, as they will keep longer and not require so much ice in shipping.

Great strides have been made in the shipping of iced fish in the past few years, and it is well demonstrated that careful handling and packing will amply repay the additional expense and trouble.

#### PREPARING FISH FOR SHIPMENT

A number of complaints have been received by the Bureau of Science that the dried fish put up in certain places in the Islands will not keep and that as a matter of fact quantities have to be thrown away because they are spoiled. This, undoubtedly, in the cases examined, resulted from slack salting and storage in damp bodegas. The only remedy for this is to spread the

fish in the sun for half a day and to keep the brine up to full strength. Shippers should see to it that the fish are absolutely dry—a simple matter in a country where the moisture evaporates as rapidly as it does in the Philippines.

Any firm that would take the slight additional trouble of putting up selected fish in smaller packages and wrapping these packages in oilpaper and then sacking them (instead of merely packing them in gunny sacks as is now the custom) would soon build up a most profitable trade.

With the exception of a few marketable fish brought from one or two southern ports, there are practically no fish shipped in fresh condition anywhere in the Philippine Islands. This is to be regretted and should be remedied as soon as possible, as there are a number of places in the Islands where large quantities of excellent food fish are caught which could easily be shipped to Manila. I believe there has been but one serious attempt to ship a large quantity of fresh fish, and that resulted disastrously, chiefly because of a lack of coöperation among the people handling the fish. A sailing ship with a quantity of ice was sent to bring a cargo of fresh fish from Mindoro. Owing to lack of ice, fish sufficient to make the voyage profitable could not be carried, although the fish shipped (*alces* or gray snappers) arrived in Manila in excellent condition. There is absolutely no reason why with proper care quantities of fine fresh fish could not be sent to Manila from numerous places such as Mindoro and Lingayen.

The results of some very interesting experiments in shipping fish have been published by the United States Bureau of Fisheries.<sup>9</sup> The results of these experiments show:

- (a) That fish spoil more rapidly if the viscera are not removed.
- (b) Free access of air retards putrefaction.
- (c) Drainage of blood retards putrefaction.
- (d) That if the intestines and head are removed and the fish is suspended by the tail so that the blood drains out, the fish will keep a considerable time without ice.

In 1908 a valuable paper<sup>10</sup> was presented to the International Fishery Congress regarding an improved method of packing fish. This method consisted in cleaning the fish thoroughly by removing the viscera and gills as soon as the fish

<sup>9</sup> Tower, Ralph W., Improvements in preparing fish for shipment, *Bull. U. S. Fish Comm.* (1899), 19, 231.

<sup>10</sup> Solling, A., An improved and practical method of packing fish for transportation, *Bull. U. S. Bur. Fish.* (1908), 28, pt. 1, 297.

were caught. They were then washed in salt water so that all the blood was removed. The water was then allowed to drain off, and the fish were wrapped in vegetable parchment called fish-wrapping paper. It is probable that the paper bags used for cooking in the United States could be used for this purpose where the regular fish-wrapping paper is not obtainable. It was found that the fish wrapped in this paper and put between layers of cracked ice (the pieces being about the size of a walnut) would retain their flavor and keep in sweet condition for a month or more, much longer than the fish prepared in the ordinary way. As the paper keeps the water out and prevents the fish from coming in direct contact with the ice, this system from a sanitary standpoint alone is to be strongly commended. It will be found that the fish keep and look so much better that they readily sell for a sum sufficient to pay for the paper and extra care.

## ILLUSTRATIONS

### PLATE I

- FIG. 1. Landing fish at Tondo beach, Manila.  
2. Fish spread on flakes for drying.

### PLATE II

- FIG. 1. Furnace for dipping sardines and herring.  
2. Smoked herring, showing furnace and baskets in which the fish are smoked and the basket covers.





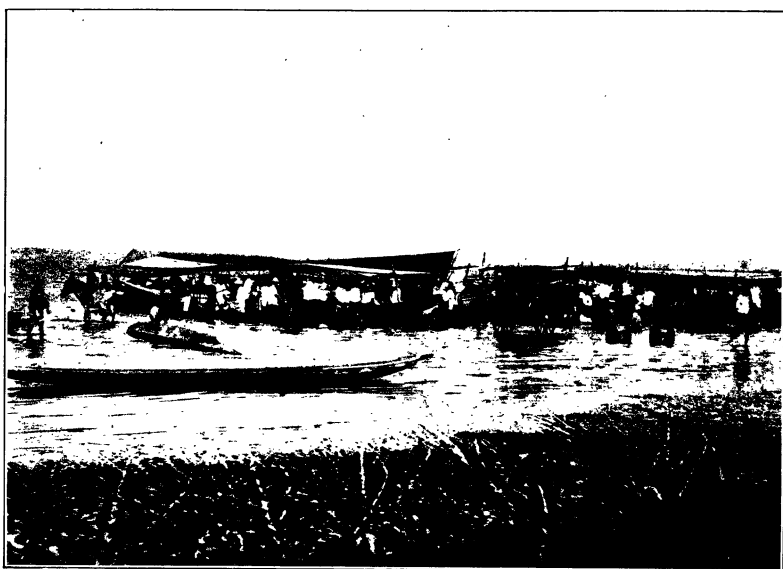


Fig. 1. Landing fish at Tondo Beach, Manila.

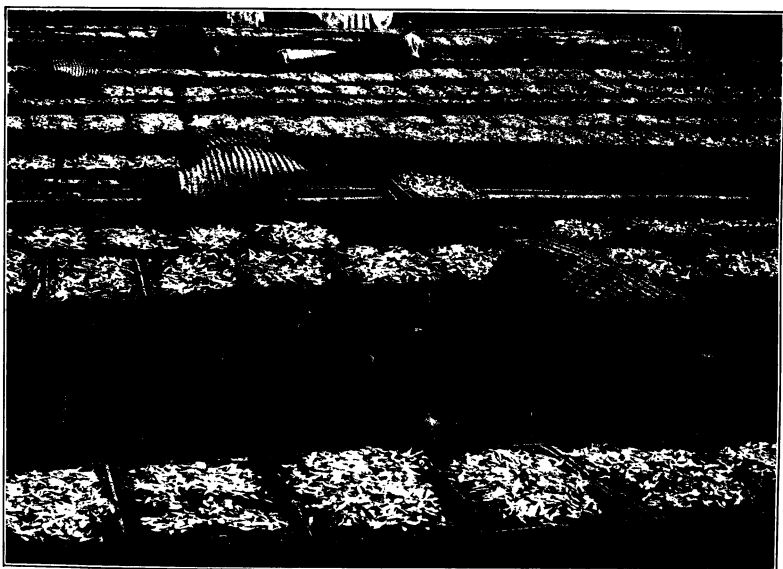


Fig. 2. Fish spread on flakes for drying.

PLATE I.





Fig. 1. Furnace for dipping sardines and herring.



Fig. 2. Smoked herring, showing furnace and baskets in which the fish are smoked and the basket covers.



# THE OSSEOUS SYSTEM OF OPHIOCEPHALUS STRIATUS BLOCH

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Nineteen plates and 7 text figures

In working out the internal skeleton of *Ophiocephalus striatus* Bloch, several specimens were dissected, although for the most part bones of a single individual have been used for purposes of illustrating the disarticulated bones. The bones of the skeleton of the fish represented in Plate I have been illustrated in this plate only, with the exception of a certain few, as for example anterior dorsal radials (85,115) shown in text fig. 2, the dorsal ray and internal spine, and the anal ray and interhæmal spine shown in text fig. 5.

In a few other instances bones of other individuals have been used; as, for instance, the glossohyal (65) shown in text fig. 7, the top of the skull, disarticulated, and a part of the suspensorium at the top of Plate VII.

The fish from the skeleton of which the illustrations of the disarticulated bones were made, with the exception of the few just named, was 50 centimeters long. Several smaller fish were also dissected, and the number of bones was found to vary considerably in specimens of different sizes. In several large individuals the total number of ribs varied from 41 to 45, the double ribs from 12 to 15, the vertebræ from 50 to 51, the interneural spines from 40 to 42, and the interhæmal spines from 23 to 25.

The character of certain bones in the larger specimen is very different from that of the bones of smaller fish. In small specimens the supraethmoid (75) and the glossohyal (65) are cartilaginous, and even in the largest specimen dissected the latter was found to be somewhat ossified in the central portion only. The partially ossified region is indicated in text fig. 7. With few exceptions the nomenclature of Starks<sup>1</sup> is here followed.

<sup>1</sup> *Proc. Wash. Acad. Sci.* (1901), 3, 507.

Plate I is taken from the left side of the whole skeleton of a fish 49.5 centimeters long. The numbers used in this plate to mark the bones are the same as are used in the individual descriptions throughout the paper.

#### I. THE SKULL AND ORBITALS

##### PLATES I, II, III, IV, AND V, AND PLATE VI, FIG. 1

The nasals (16) are somewhat rectangular, rather flat bones, with curved edges. Sensory canals pass from posteriorly anteriorly from the frontals (36) opening on the dorsal side a short distance from the anterior end. They articulate posteriorly with the frontals (36) and prefrontals (76), with the orbital (18<sup>e</sup>) outside, with the ethmoid (81) and supraethmoid (75) inside, with each other in front, and with the premaxillaries (1) below and anteriorly. Their curved interior sides form an opening through which project the dorsal side of the ethmoid (81) and the dorsal processes of the premaxillaries (1). (Plates I and II.)

The supratemporals (26) are somewhat right-triangular with the outward right angle slightly rounded off. They are perforated throughout the whole length by sensory canals. They lie above the articulation of the pterotics (38) and epiotics (79), and articulate with the parietals (37) anteriorly, while the posterior portion articulates with the base of the short spine of the posttemporals (27). (Plate II.)

The posttemporals (27) have a comparatively large oval body posteriorly, and anteriorly are widely forked, the larger branch, inside, articulating with the epiotics (79) and the shorter with the process of the pterotics (38). The posterior oval portion covers a part of the space between the opercles (14) and the epiotics (79). (Plates I and II.)

The supraoccipital (35) is situated between the parietals (37), about half of the upper surface extending anterior to them, and to which they are joined by broad flat condyles. The V-shaped anterior end is articulated with the frontals (36). Posteriorly it is joined to the exoccipitals (72) and the epiotics (79). Below it is joined to the prootics (78). The wide flat lateral processes form a part of the roof of the accessory branchial chamber. (Plate II; Plate IV, fig. 1; Plate V, fig. 1.)

The frontals (36) are somewhat rectangular, and twice as long as broad. They are extensively tunneled by sensory canals. The ventral side has an oblique ridge for articulation with

the basisphenoid (83) and the parasphenoid (66). They also articulate anteriorly with the nasals (16) and the prefrontals (76), outwardly laterally with the sphenotics (39), and with the ethmoid (81) anteriorly. Posteriorly they articulate with the pterotics (38). Just posterior to the ventral processes of the frontals, and lying close to them, the alisphenoids (122) are found. The oblique ridge-like ventral process of the frontals is continuous with the alisphenoids (122), and the somewhat flattened dorsal portion of the alisphenoids (122) lies against the flat ventral side of the frontals, posterior to their processes. In Plate II the frontals are seen from the dorsal side in the articulated top of the skull. In Plate III, disarticulated, the right is seen from the ventral side and the left from the dorsal. In Plate IV, fig. 2, the right frontal is seen from the right margin as also in Plate VI, fig. 1. In Plate V, fig. 1, they are seen in the articulated skull, from the ventral side. The left frontal is seen in Plate I.

The parietals (37) are roughly pentagonal in form, being almost flat—slightly convex above—and very thin. They articulate with the frontals (36) anteriorly, the supraoccipital (35) inside, the pterotics (38) outside, the epiotics (79) posteriorly, and form a part of the roof of the accessory branchial chamber. In Plate II the parietals are seen in the articulated skull from the dorsal side. In Plate III they are disarticulated, the right being seen from the ventral side and the left from the dorsal.

The pterotics (38) are somewhat rectangular in form, but with a spine-like process on the posteroexternodorsal side. The lower side has a ridge in the form of an arc, which bounds the portion serving as a part of the roof of the accessory branchial chamber. They articulate with the sphenotics (39) anteriorly, the parietals (37) inside, the epiotics (79) internally, and with the head of the hyomandibulars (10) below. The interno-posteroventral portion of the pterotics articulates with the externoanterior portion of the opisthotics (123). The pterotics are seen in Plate II from the dorsal side in the articulated skull. In Plate III they are disarticulated, the right being shown from the ventral side and the left from the dorsal side. The left is seen in Plate I. In Plate VI, fig. 1, the right pterotic is seen from the right side. In Plate V, fig. 1, the pterotics are seen from the ventral side in the articulated skull.

The sphenotics (39) are somewhat triangular and flat above, with a ridge below, slanting inward, which unites with the prootics (78). Internally and anteriorly the articulation is with

the frontals (36), and posteriorly with the pterotics (38). On the ventral side there is a fossa for the articulation of the anterior limb of the head of the hyomandibular (10). They are perforated throughout the whole length by the large sensory canals passing from the frontals (36). On the ventral side they articulate internally with the alisphenoids (122). In Plate I the left is seen. In Plate II both are viewed in position, from the dorsal side. In Plate III they are disarticulated, the right having the ventral surface in view, while the left, the dorsal surface. In Plate IV, fig. 2, the right is seen from the right side, as also in Plate VI, fig. 1. In Plate V, fig. 1, both are seen from the ventral side.

The parasphenoid (66) extends from about the median dorsal portion of the vomer (67) to almost the posterior portion of the basioccipital (69). It sends out lateral laminae in the region of the proötics (78), and on the sides, in the region ventral to the basioccipital (69), are the posterior openings and grooves from the myodome. Ventrad to the basisphenoid (83) and anteriorly is another thin lamina on each side, which, together with the central "stock" or "rib," help to form the brain cavity. Anteriorly, the articulation is with the vomer (67) and the ethmoid (81), between which this portion lies. In Plate III the parasphenoid is seen from the dorsal side, disarticulated; in Plate IV, fig. 2, in the articulated skull from the right side; in Plate V, fig. 1, in the articulated skull from the ventral; and in Plate VI, fig. 1, in the articulated skull from the right side.

The vomer (67) anteriorly is broad with 2 triangular patches of teeth. Just back of this "head," there is a horizontal thin portion with a median rib, the latter extending to the posterior end. The dorsal outline is clearly shown in Plate III. It articulates with the ethmoid (81) dorsally, laterally with the prefrontals (76), and posteriorly with the parasphenoid (66). In Plate II the anterior end of the vomer is seen in the articulated skull; in Plate III the dorsal side in the disarticulated skull; in Plate IV, fig. 2, from the right side; in Plate V, fig. 1, in the articulated skull, from the ventral; and in Plate VI, fig. 1, in the articulated skull from the right side.

The basioccipital (69) forms the centrum of the condyle for the attachment of the atlas (70). There is a longitudinal suture separating it from the exoccipitals (72), and anteriorly a vertical suture separating the basioccipital and exoccipitals (72) from the proötics (78). The longitudinal suture between the basioccipital and exoccipitals (72) passes through the middle



of the auditory capsule. The dorsal side borders the foramen magnum. In Plate IV, fig. 1, it is seen from the dorsal side; in Plate IV, fig. 2, from the right side, articulated; in Plate V, fig. 1, in the articulated skull from the ventral side; and in Plate V, fig. 2, in the articulated skull from the posterior.

The exoccipitals (72) border the foramen magnum on the dorsal and internal side. A short distance within the foramen they unite as a narrow bridge of bone just dorsad to the bassioccipital (69), which latter forms the ventral side of the foramen at the posterior opening. The lateral portions extend outward and upward, articulating with the epiotics (79) laterally, with the supraoccipital (35) anteriorly above, with the proötics (78) anteriorly ventrally, and with the bassioccipital (69) below. The median portion of the dorsolateral process articulates with the ventral margin of the opisthotics (123). The exoccipitals are seen from the dorsal side of the articulated skull in Plate II; in Plate IV, fig. 1, disarticulated from other bones, from the dorsal; and in Plate V, fig. 2, in the articulated skull from the posterior. In Plate IV, fig. 2, and Plate VI, fig. 1, the right shows from the right side.

Otoliths (73). In a fish 50 centimeters in length, these are 18 millimeters long, 10 millimeters wide, and 3 millimeters thick. They are irregularly oval, somewhat curved, and on the convex side is a somewhat S-shaped groove over the whole length. In color they are like milky quartz, and there are concentric lines running about them like the rings of growth in the shell of the Pelecypoda. In Plate II the left, and in Plate III the right, is seen from the side fitting against the outer margin of the proötic (78), while in the same plates the other is seen from the inside or concave surface.

The supraethmoid (75) is a light, spongy bone, which in very young forms is cartilaginous. It is thickest posteriorly. The general form from the dorsal side can be seen very well in Plates II and III. It is situated dorsad to the anterior portion of the ethmoid (81) and the posterior portion of the head of the vomer (67). It is partly ventrad and partly posterior with respect to the dorsal processes of the premaxillaries (1). The supraethmoid, together with the dorsal processes of the premaxillaries, extend dorsally through the opening between the curved sides of the nasals (16).

Lying laterally to the ethmoid (81) and anteriorly to the frontals (36) are the prefrontals (76), somewhat wing-like laterally, and perforated anteriorly posteriorly by a large sen-

sory canal. In Plate II they are seen articulated from the dorsal side; in Plate III from the dorsal, disarticulated; and in Plate V, fig. 1, articulated, from the ventral side. In Plate IV, fig. 2, and Plate VI, fig. 1, the right is seen, articulated, from the right side. In Plate I the left is dimly seen.

In Plate V, fig. 1, the ventral side of the proötics (78) is shown in position. In Plate III the left is shown from the dorsal side, and the right from the ventral. In Plate IV, fig. 2, and Plate VI, fig. 1, the right is seen laterally. They articulate with the parasphenoid (66) ventrally and internally, the sphenotics (39) laterally, the alisphenoids (122) laterodorsally, the basisphenoid (83) interodorsally, the exoccipitals (72) posterodorsally, the basioccipital (69) posteriorly, and contain within them the otoliths (73). The form is shown in the illustrations. The myodome or chamber for the insertion of the rectus muscle of the eye is formed by projecting shelves of bone from the internal sides of the proötics, and is separated from the brain cavity by them. The basioccipital (69) also assists here. It is concave on the ventral side, forming a cavity with the parasphenoid (66). This cavity opens to the exterior by an opening on either side from above the posterior end of the parasphenoid (66).

The epiotics (79) articulate with the pterotics (38) on the outside, with the exoccipitals (72) on the inside, and internoanteriorly with the supraoccipital (35) and parietals (37). The main portion is somewhat pyramidal, with the base turned anteriorly and outwardly. Posteriorly and obliquely toward the spinal column is a broad expanse of thin bone about the same length as the main portion of the bone. This is somewhat fan-like with concentric rings. This thin expanse stands at almost a right angle to the body of the bone. As illustrated in Plate V, fig. 1, they articulate with the opisthotics (123) which overlie the posterolateral portion of the ventral surface of the epiotics. They are seen in Plate II, articulated, from the dorsal side; in Plate V, fig. 1, the posterior fan-like expanse from the ventral side; and in Plate V, fig. 2, is the posterior view. In Plate IV, fig. 1, the right is displayed from the dorsal side, while the left has the ventral side uppermost. In Plate IV, fig. 2, the right side of the posterior portion of the right bone is visible.

The ethmoid (81) is somewhat oval above, with two lateral processes dorsally which articulate with the nasals (16). Laterally it articulates with the prefrontals (76), posteriorly with the frontals (36), and ventrally with the parasphenoid (66) and

the vomer (67). Anteriorly are 4 cartilaginous projections, 2 in front and 1 at each side, and posteriorly 1 cartilaginous projection, which aid in articulation. These projections are shown in the illustration. Ventrally the ethmoid is a much narrower oval, and the thin median ventral portion overlies the median parasphenoid (66) anteriorly. The whole bone is very porous, especially the laterodorsal portions. It is visible from the dorsal side, articulated, in Plate II, and disarticulated in Plate III.

The basisphenoid (83) has rather thick lateral wing-like processes, which are slightly wider anteriorly than posteriorly, and there is a short spinous portion posteriorly that fits into a longitudinal slit-like fossa in the dorsal side of the parasphenoid (66). The lateral portions articulate with the ventral ridges of the frontals (36) and the alisphenoid (122) and slightly with the anterior portions of the proötics (78). Plate III shows it from the dorsal side; Plate IV, fig. 2, shows the anterior process of the right side; and Plate V, fig. 1, the anterior process of the left side—that of the right side not being visible here.

The alisphenoids (122) articulate with the frontals (36), laterally and dorsally, interoventrally with the basisphenoid (83), posteroventrally with the proötics (78), and laterally with the sphenotics (39). They lie close against the ventral side of the frontals, and closely posterior to their ventral process. On the dorsal side there is a flange supporting them against the ventral side of the frontals (36). They are porous and somewhat perforated with sensory canals. They are shown in position in Plate V, fig. 1, from the ventral side, while in Plate III that of the right side is shown from the ventral side, disarticulated, with the outer margin toward the inside of the plate.

The opisthotics (123) articulate with the exoccipitals (72) and pterotics (38), overlying the space between the two bones named and covering the epiotics (79) on the ventral side. They are seen in Plate IV, fig. 1, the right being shown from the dorsal side, while the left is shown from the ventral side. In Plate V, fig. 1, both are seen from the ventral side in position, and in Plate V, fig. 2, the view is from the posterior. In Plate VI, fig. 1, the right is seen from the right side. They are somewhat triangular, porous, and perforated by sensory canals. These, together with parts of the epiotics (79), inclose a small cavity in the ventral side of the latter.

Suborbitals and preorbitals,  $18^{1-6}$ . The suborbitals are  $18^5$ ,  $18^4$ ,  $18^3$ ,  $18^2$ , and  $18^1$ ; and  $18^6$  is the preorbital. These are all

shown in Plate VI, fig. 2. At the right in the top line all are shown united, while at the left in the same line the bones are shown separately, with the 4th suborbital, 18<sup>2</sup>, seen from the posterior side showing the flange that forms the posterior side of the orbit. Those in the lower row are seen from the left side and from the outer—lateral—side. All of the orbitals are perforated by sensory canals almost continuously and with various openings to the exterior. Anteriorly and posteriorly the articulation is with the frontals (36), while 18<sup>2</sup>–18<sup>6</sup>, inclusive, closely overlie the maxillaries (5). Those at the right, united, are from a somewhat smaller fish than those disarticulated. They are also illustrated in Plate I.

## II. SUSPENSORIUM AND OPERCULAR APPARATUS

### PLATES VII AND VIII

The palatines (2) articulate anteriorly with the vomer (67), with the pterygoids (80) posteriorly, and the mesopterygoids (71) dorsally. The anterior process of the palatines passes dorsally over the maxillaries (5), articulating with them. The palatines are continuous with the pterygoids (80) and the quadrates (7). The posterior portion of the palatines lies interior to the maxillaries (5). The exterior side is shown in Plate VII and the interior side in Plate VIII.

The quadrates (7) are almost right-triangular in form, the right angle being ventral. Anteriorly there is a broad, flattened portion, articulating with the pterygoids (80) and the mesopterygoids (71) and dorsally with the metapterygoids (8). The posterior portion, which is in the form of a broad flat spine at right angles to the anterior portion, projects posteriorly into a fossa in the lower anterior portion of the preopercles (11). On the inside, between the anterior and posterior parts, is a groove, at the bottom of which is a fossa into which the lower spinous portion of the symplectics (9) fits. The wide portion at the right angle articulates with the posterior end of the angulars (12). Plate VII shows the quadrates from the exterior side both articulated and disarticulated, while Plate VIII exhibits them from the internal side.

The metapterygoids (8) articulate with the mesopterygoids (71) anteriorly, the quadrates (7) ventrally, the symplectics (9) posteriorly, and with the hyomandibulars (10), the frontals (36), and the sphenotics (39) dorsally. From the center of the posterior somewhat square portion there arises an oblique ridge

on the inside, which passes along the inside of the hyomandibulars (10). The outside of the right bone is shown in Plate VII and the inside in Plate VIII. The left is also included in Plate I.

The symplectics (9) consist of a somewhat curved central triangular portion with the base upward, and anteriorly and posteriorly from this extends a wing-like process. They articulate with the metapterygoids (8) anteriorly, while the pointed ventral portion becomes ankylosed with the inside of the quadrates (7). They are little more than laminate in the central triangular portion only. The outside of the bone on the right side is shown in Plate VII, and the inside of the bone on the left side of the head is shown in Plate VIII. The left is also included in Plate I.

The hyomandibulars (10) consist of a somewhat columnar head or dorsal portion, from which there projects a ventral lamellar portion, reinforced in the middle region by a thickened triangular area similar to that of the symplectics (9) with which this portion of the hyomandibular articulates. From this lateral part of the bone there projects, at right angles, into the region of the accessory branchial chamber, a lamellar portion, internally, which assists in supporting the membranes there. The anterior portion of the head of the hyomandibulars fits into a groove on the ventral surface of the sphenotics (39), the posterior portion fits into a similar but shallower fossa on the ventral surface of the pterotics (38), while the posterior end of the head fits into the socket on the inner, anterior, upper portion of the opercle (14). Ventrally they articulate with the symplectics (9) and the metapterygoids (8), with the interhyals (21) internally, and with the preoperculars (11) posteriorly. They are perforated with canals continuous with those of the preoperculars (11). The outside of the bone of the right side is shown in Plate VII, and the inside of the bone on the left side is shown in Plate VIII, while the left is seen in Plate I.

The outline of the preopercles (11) is clearly shown in the plates. Plate VIII shows the inside of the bone on the left side, and Plate VII the outside of the bone on the right side. They articulate with the hyomandibulars (10), the symplectics (9), and the quadrates (7) anteriorly, with the operculars (14) posteriorly, and the interoperculars (40) on the inside posteriorly. On the inside they articulate with the interhyals (21), which lie vertically on the preopercles (11). They are perforated throughout the whole length by sensory canals.

The subopercles (13) articulate with the opercles (14) dorsally, the angle following the lower margin of the same and overlapping slightly on the inside. Ventrally and anteriorly they articulate with the interopercles (40), and the anterior dorsal process lies on the inside of the median portion of the preopercles (11). They are lamellar throughout except for a slight perforated thickening anteriorly and dorsally, and are convex on the outside. The inside of the bone on the left side is shown in Plate VIII, and the outside of the bone on the right side is shown in Plate VII. In Plate VI, fig. 1, the posterolateral margin of the left is seen from the inside. In Plate I the left is shown from without.

The opercles (14) are roughly right-triangular with the right angle anterior and dorsal, and are convex outwardly. They are thickly lamellar with reinforcements along the anterior margin, dorsoanteriorly, and with a ridge running anteriorly posteriorly about one-third of the distance from the dorsal margin, along the inside. This ridge continues anteriorly in a large expanse, concave anteriorly, which serves for the socket of the posterior end of the head of the hyomandibular (10). The opercles appear to be made up of a considerable number of concentric rings like the shell of the Pelecypoda, with the center, corresponding to the umbo of the shell, just inside the socket for the articulation of the posterior end of the head of the hyomandibulars (10). The inside of the bone on the left is shown in Plate VIII, and the outside of the bone on the right side is shown in Plate VII. In Plate VI, fig. 1, a part of the inner surface of the left is in view. The left is also seen in Plate I.

In Plate VIII the left interoperculum (40) is shown from the interior and in Plate VII the right from the exterior. In Plate VI, fig. 1, the inner ventral margin of the left may be seen, and in Plate I the left is viewed. The interopercula overlie the branchiostegal rays (22) and a portion of the epihyals (20), and also posteriorly they overlie the anterior margin of the subopercles (13). The dorsoanterior portion lies internally with respect to the ventral part of the preopercles (11), with which they articulate. The dorsal process overlies the epihyals (20). Posteriorly the interopercles are somewhat lamellar, while the anterior portion, as also the dorsal process, is somewhat thickened. Anteriorly they articulate with the posterior portions of the angulars (12) and the articulars (4).

The mesopterygoids (71) are thin wing-like bones, somewhat convex on the outside, and about twice as long as broad. They

articulate forward and on the outside with the palatines (2), on the lower side with the pterygoids (80), posteriorly and ventrally with the palatines (2), on the lower side with the pterygoids (80), posteriorly and ventrally with the quadrates (7), and posteriorly with the metapterygoids (8). They are about as long as the palatines and about three-fourths as long as the frontals (36). The outside of that of the right side is represented in Plate VII and the inside of the left in Plate VIII.

In Plate VIII the interior side of the left pterygoid (80) is shown, and in Plate VII the exterior of the right. They articulate with the palatines (2) anteriorly, the posterior ends of which extend into the anterior fossa in the pterygoids. The posterior end lies inside of, and articulates with, the anterior portion of the quadrates (7). The ventral margin of the mesopterygoids (71) lies internally to, and articulates with, the interior and dorsal margin of the pterygoids. The anterior spinous portion lies along the dorsal side of the palatines (2). At the top of Plate VII the pterygoid is seen still articulated.

### III. MANDIBLE

#### PLATE IX

The premaxillaries (1) are curved and tapering from the middle region posteriorly, where they are cartilaginous and almost spinous. At the anterior end is a dorsal process divided into two parts, the more anterior being the higher. The shorter sets just below the nasals (16), while the longer passes dorsally through the opening between the nasals (16) and anteriorly to the supraethmoid (75). The teeth anteriorly on the ventral side are moderately large, while those posteriorly are very fine. On the inside margin of the posterior two-thirds is a ridge of cartilage which is continuous with a short ridge-like process of bone, originating a short distance posterior to the dorsal process. The premaxillaries articulate with the maxillaries (5) anteriorly and posteriorly, lying ventrad to them. They articulate with each other anteriorly, and the higher dorsal process at the anterior end of each overlies the anterior surface of the supraethmoid (75). They lie laterad of the palatines (2) and the pterygoids (80), and the anterior end of each overlies the vomer (67). (Plate I; Plate VI, fig. 1; and Plate IX.) In Plate IX the dorsal side of the left and the central side of the right are exposed. The left is also seen in Plate I.

The left and right dentaries (3) are shown from the dorsal side and the outer lateral side, respectively. They dovetail

into the articular (4) posteriorly, and articulate with each other in front. There is a deep fossa extending anteriorly into the dentaries, opening toward the inside posteriorly, into which the outer longer portion of the articular (4) extends. There is also a canal on the inside of the furrow, leaving two openings anteriorly, one on the ventral side and the other forward on the outside.

There is a single row of large conical teeth extending for a part of the length of the dentaries but not continuing either entirely anteriorly or posteriorly, while posterior to these large teeth are some smaller conical teeth. Anteriorly is a mass of cardiform teeth. Also on the outside of the large teeth is a row of the very small conical teeth, and some of them have still smaller teeth at their bases on the inside. (Plate I and Plate IX.)

The articulars (4) articulate anteriorly with the dentaries (3) and with the quadrates (7) and with the angulars (12) posteriorly. They form an obtuse angle at the outer lower margin, with a high dorsal process at the outer posterior part. Anteriorly are two processes, the outer being the longer and sharper. These two articulate with the dentary (3), the outer and longer process extending into the fossa of the dentary (3) and the other lying along the inside of the dentary (3). The sensory canal in the dentaries (3) is continuous with a similar canal in the articulars. In the depression continuous with that formed by the union of the two anterior processes is a small scale-like bone, the intra-articular (86). (Plates I and IX.)

The maxillaries (5) extend inside the suborbitals (18) just above the premaxillaries (1), articulating with them anteriorly and posteriorly, and the dorsal process fits in between the dorsal processes of the premaxillaries (1) and the anterior processes of the palatines (2). Posteriorly they extend as far as the posterior end of the articulars (4) and the dorsal angle of the quadrates (7). The dorsal view of the left is shown in Plate IX, as is also the ventral view of the right, and in Plate I the left is displayed.

The angulars (12) articulate closely with the posterior inner end of the articulars (4) and with the interopercles (40) posteriorly. The dorsal side of the left is shown disarticulated from the articular (4) and the right still articulated. (Plate IX.)

These "intra-articulars" (86) lie in the angle of the articulars (4). In Plate VI that of the right side is seen detached, from



the dorsal side, and the left is seen still lying in the angle of the left articular (4). The ventral side is flattened, while the dorsal is somewhat conical. They lie with the median portion opposite the attachment of Mackel's cartilage with the articulators (4). This name is here given because of the location.

#### IV. PECTORAL AND PELVIC GIRDLES

##### PLATE X

At the left of Plate X is the left clavicle (62), with the dorsal portion of the postclavicle (77), the hypercoracoid (15), and the hypocoracoid (30) attached, and seen from the inside. Toward the right is the right clavicle, seen from the outside, and disarticulated. The two clavicles articulate together forward and ventrally, then pass posteriorly diagonally toward the dorsal side, and lie along the interior side of the interopercles (40), the subopercles (13), and the opercles (14). The dorsal portion of the clavicles is articulated with the supraclavicles (28). (Plates I and X.) The dorsal end of the clavicles, which is seen toward the bottom of the plate, is somewhat lamellar, but is reinforced posteriorly by a considerable thickening, continuous with the thickening of the middle part of the bones passing upward from the ventral expanded condyles. From the middle portion extends a somewhat lamellar portion, convex anteriorly and concave posteriorly. Within this concavity the hypercoracoid (15) and the hypocoracoid (30) are articulated. The anterodorsal spinous process extends interiorly to the posterior end of the supraclavicles (28). The posterior expanse or wing of the right clavicle, which aids in the articulation of the hypercoracoid (15) and the hypocoracoid (30), is seen a short distance from the dorsal end.

The interior side of the left supraclavicles (28) is shown on the left of Plate X, while that of the right side is seen from the outside. The anterior end articulates with the ventral side of the body of the posttemporal (27). The supraclavicles extend backward along the inside of the opercles (14) and along the outside of the dorsal portion of the clavicles (62) with which they articulate. Along the inside at the dorsal margin there is a fossa which looks as if formed by the rolling over of the dorsal margin. The condyle at the anterior end is somewhat hooked externally, as is shown especially in the bone of the right side. The left is also indicated in Plate I.

Postclavicles, lower part (6). These, as well as the upper part of the postclavicles (77), are lamellar. The upper one-

third of the lower part lies over or outside of the upper part (77). The form is well shown in Plate X. On the right side of the plate the upper part (77) and lower part lie separately. On the left side of the plate the parts of the left postclavicle overlies the inside of the clavicle (62), the hypercoracoid (15), and the hypocoracoid (30).

The postclavicle, upper part (77), articulates with the posterior upper expanse of the clavicles (62), and lies almost parallel with it. The lower end articulates with the lower part of the postclavicle (6). This part of the postclavicle also is lamellar, and the form can be readily seen in Plate X.

On the left side of Plate X the inside of the bases of the pectoral rays (29) of the left side is shown, while on the right side of the plate are the pectoral rays of the right side. These articulate with the actinosts (31) in each fin. In Plate I the left pectoral is present. The number of rays articulating with each of the actinosts may be determined from the plate.

The pelvic rays (33) are attached to the pelvic girdle (32), and are shown in Plate X and, also, in Plate I.

The hypercoracoids (15) are somewhat roughly quadrangular bones, articulating with the actinosts (31), the hypocoracoids (30), and the clavicles (62). In Plate X the left is shown articulated with the hypocoracoid (30) and the clavicle (62), while on the right side it is isolated. Each is pierced by a large foramen. The edge articulating with the actinosts (31) is much thickened, while the remainder is very thin, being thinnest around the foramen. The dorsal portion of the hypocoracoids extends inward at an angle to conform to the interior of the clavicles (62). The left is indicated in Plate I.

The hypocoracoids (30) are articulated with the clavicles (62) anteriorly by two processes, with the two ventral actinosts (31) posteriorly, and with the hypercoracoids (15) dorsally. In Plate X the left hypocoracoid is seen at the left side, internally, with the ventral portion of the postclavicle (6) lying over it, and articulated with the hypercoracoid (15) and the clavicle (62). On the right side the right hypocoracoid is shown from the outside. Interiorly the ventral portion has an angular furrow, at the bottom of which is the prolongation of the ventral process seen at the top in the plate. The sides of the furrow are lamellar. The dorsal portion is lamellar with a considerable thickening at the region of articulation with the actinosts (31). In Plate I the posterior and ventral portions are to be seen.

The actinosts (31) are 4 in number on each side. The most

ventral articulates anteriorly with the hypocoracoid (30), the next articulates with the hypocoracoid (30) and the hypercoracoid (15), and the 2 dorsal ones articulate with the hypercoracoid (15), while posteriorly all articulate with the pectoral rays (29). The condyles are much thickened, being about 1.5 millimeters, while between them the bones are about 0.5 millimeter. The epicondyle of the ventral actinost is very thin. The actinosts are found in Plate X, and are shown from within, the left actinosts being at the left side. The right actinosts are represented from the outside. The left actinosts may also be seen in Plate I.

The pelvic girdle (32) is united anteriorly with the ventral portions of the clavicles (62) by ligaments, and is separated from them a distance about two-thirds its length. The posterior condyles of the two parts of the girdle are much thickened to articulate with the anterior ends of the pelvic rays (33). The right and left parts are shown from the dorsal side in Plate X, and the left part from the left side in Plate I.

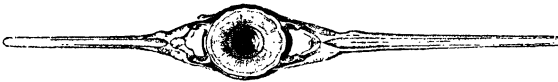


FIG. 1. Caudal vertebra, the last but 2 (181), anterior view.  $\times 2$ .

## V. VERTEBRÆ, RIBS, AND HYPURALS

### PLATES XI AND XII

The first 3 vertebræ have no transverse processes (46, 47). From the 4th to the 8th they grow longer and extend farther laterally, although they immediately begin to slant ventrally, so that a little posterior to the median abdominal region they are almost vertical. The fossæ of the transverse processes of the 3d, 4th, and 5th ribs are turned dorsally, then in the succeeding ribs they begin to turn more and more posteriorly, until in the 18th vertebra they face posteriorly.

The first 2 vertebræ, atlas and axis, receive the articulation of a pair of single ribs, the succeeding 15 vertebræ the articulation of a pair of double ribs, and the remainder, except the last 5 vertebræ, have a pair of single ribs articulated.

In Plate XI the atlas (70) is seen from the posterior side and slightly tilted posteriorly, showing the centrum, neural arch, and neural spine. It is seen also in text fig. 2.

The axis (87) is seen from the posterior, showing the centrum,

neural arch (126), and neural spine (43). (Plate XI.) This is seen also in text fig. 2.

The 5th vertebra (88) of the spinal column is here seen posteriorly. It shows the neural spine (43), neural arch (126), centrum, and transverse processes (46). The last are here horizontal, and receive the articulation of a pair of double ribs. (Refer to Plate XI.) The neural spine of this vertebra may be seen in Plate I.

The 6th vertebra (89), 6th of the spinal column, seen from the left side shows the neural spine (43), while the transverse processes are over the body of the vertebra. Prezygapophyses (127) and small postzygapophyses (128) are seen. This is shown in Plate XI from the left side, and the neural spine is indicated in Plate I.

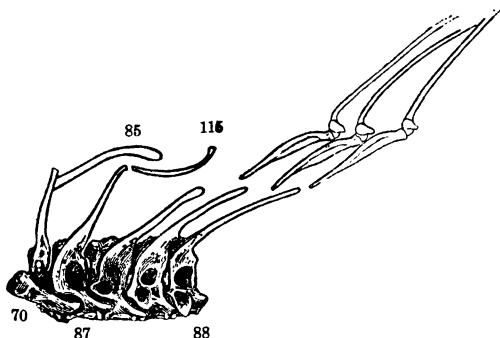


FIG. 2. Atlas (70); axis (87); 3d, 4th, and 5th vertebrae; interneural spines; dorsal rays; and anterior dorsal radials (85 and 115). Natural size.

The 7th vertebra (90) (42 in Plate I) is seen from the anterior side, showing the neural spine (43), the transverse processes (47), the neural arch, and the centrum (97). This is indicated in Plate XI and, also, in Plate I.

The 20th vertebra (91), from the posterior side in Plate XI, shows the transverse process (49), the neural spine (43), the neural arch, and the centrum (98). Transverse processes are here passing toward the vertical. Plate I also shows this vertebra from the left side.

The 21st vertebra (92) is viewed from the left side. It shows the prezygapophysis (127), the postzygapophysis (128), neural spine (125 and 43), and the transverse process (49). The transverse processes approach more nearly the vertical. Plates I and XI illustrate this vertebra.

The 22d vertebra (93) shows the neural spine (43), centrum

(99), and transverse process (49). It is viewed from the anterior side in Plate XI. In Plate I the left side is shown.

The 7th vertebra (94) from the last, in Plate XI, is viewed from the posterior side showing the neural spine (43), neural arch (126), and centrum (100). It is also seen, articulated, from the left side in Plate I.

The 6th vertebra (95) from the last shows the neural spine (43, 125), prezygapophysis (127), and postzygapophysis (128). This is viewed from the left side. Plate XI represents it from the left side disarticulated, and Plate I, articulated.

The 5th vertebra (96) from the last is viewed from the anterior side in Plate XI, showing the centrum (101), the neural spine (43), and the neural arch. Also, Plate I shows it, articulated, from the left side.

The last caudal vertebra but 4 (129) illustrated in Plate XII, fig. 2, shows a neural spine (51), hæmal spine (52), prezygapophysis, postzygapophysis, anterior ventral process, and lateral foramina, being seen from the left side.

The last caudal vertebra but 3 (130) in Plate I and Plate XII, fig. 2, shows the same parts as 129, but with much longer neural (51) and hæmal (52) spines.

The last caudal vertebra but 2 (131) in Plate I and Plate XII, fig. 1, shows the same structures as number 129, but the neural and hæmal spines arise from the middle and anterior portion of the centrum of the vertebra. Also, there is a dorsal process on the hæmal spine a short distance from the centrum. This process on the dorsal side of the hæmal spine (52) helps to articulate with the detached hæmal spine (52) of the last caudal vertebra but 1 (132). The anterior side is illustrated in text fig. 1.

The last caudal vertebra but 1 (132) bears the neural spine (51), prezygapophysis, and hæmal spine (52), the last being detached. This last contains the hæmal arch within itself. In Plate I this is seen in the articulated skeleton, and in Plate XII, fig. 1, it is disarticulated, with the hæmal spine (52) detached.

The hypural vertebra (34) is the last vertebra, and articulates with all of the hypurals except 102 and 103, dorsally, posteriorly, or ventrally. Anteriorly it articulates with the next vertebra. The posterior dorsal process receives the condyles of the hypurals (53) in its deep ventral fossa. It bears prezygapophyses (?) which extend dorsally, and the posterior ventral process is at the extreme posterior ventral margin. Plate I and

Plate XII, fig. 1 (the articulated skeleton), illustrate this vertebra from the left side.

Suspended above the anterior end of the spinal column are the two anterior dorsal radials (85, 115). In Plate I, as also in text fig. 2, they are represented in their natural positions. It will be observed that the convex side of the first (85) is dorsal, overlying the neural spine of the axis, while the concave side of the second (115) is dorsal, and overlies the neural spine of the third vertebra.

Neural spine 41 is somewhat posterior to the median abdominal region.

Neural spine 43 is the spine of the 7th vertebra, bearing Nos. 42 and 90 in Plate I, while in Plate XI it represents the neural spines of all the vertebræ illustrated.

Neural spines 51 are shown in Plate I and in Plate XII, fig. 1; the latter are the neural spines in the caudal region. In Plate XII, fig. 1, the vertebræ are disarticulated, while Plate I shows them articulated.

Neural spines 125 are of vertebræ 92 and 95. Other neural spines are No. 43. These are illustrated in Plates I and XI.

The neural arch (126) is of the vertebra that is the last but 7, No. 94, and of the 2d and 5th vertebræ, Nos. 87 and 88, in Plate XI.

Hæmal spines (52). In Plate I the vertebræ are articulated, and in Plate XII, fig. 1, they are disarticulated. It will be noted that the hæmal spine of the last vertebra but 1 is disarticulated from the centrum.

Transverse process (46). This number indicates the transverse process of the 5th vertebra, No. 88. Plate XI.

Transverse process (47). This is on the 7th vertebra, Nos. 90 and 42. Plate XI.

Transverse process (49). This number indicates the transverse process on the 21st vertebra, No. 92; and on the 22d vertebra, No. 93; and also in Plate I it indicates the transverse process on the 25th vertebra. (Plate XI.)

The prezygapophyses (127) are illustrated in Plate XI, the 21st vertebra being No. 92; and in the last vertebra but 6, No. 95.

The postzygapophyses (128). These are designated in Plate XI in the 6th vertebra, No. 89; the 21st vertebra, No. 92; and in the last vertebra but 6, No. 95.

The anterior ventral process (134) and the posterior ventral

process (135) are used in Plate XI in describing the last vertebra but 6, No. 95.

The hypurals (53) articulate anteriorly with the hypural vertebra (34) and posteriorly with the caudal rays (54, 55). The second from the ventral has its anterodorsal processes designated No. 60. No. 124 lies over the anterior end of the dorsal broad hypural articulating with it, joining this hypural with the dorsal surface of the hypural vertebra (34). The second broad hypural from the dorsal side articulates with the posterodorsal process of the hypural vertebra (34), the next 3 hypurals with the posterior surface of the hypural vertebra (34), while the last broad hypural, or that bearing the process No. 60, articulates with the posterior surface of the hypural vertebra, the two anterodorsal processes passing dorsally at the sides. Lying along the most dorsal broad hypural is the narrow hypural (102), and below the most ventral broad hypural is also a narrow hypural (?) (103), very similar to 102. (Plates I and XII.)

The anterodorsal processes (60) of the most ventral wide hypural (53) pass off from the anterior dorsal surface of the most ventral wide hypural, extending laterally around the hypural and hypural vertebra (34) lying dorsally, and really forming the hæmal arch. The dorsal tips of these processes lie at a considerable distance from the hypurals (53) above, embedded in the muscle. (Plate I and Plate XII, fig. 1.)

Hypural (?) No. 102 articulates with the anterior portion of the most dorsal broad hypural (53) and with the neural spine of the vertebra that is the last but one. It is of a form similar to the neural spines of the four vertebræ anterior to the hypural vertebra, but in thickness, color, and certain other characteristics it resembles the other hypurals (53) although being narrower. It lies between 124 and the body of its hypural (53) and the neural spine of the vertebra that is the last but one, and articulates with them. In Plate I it lies in articulation, while in Plate XII, fig. 1, it is disarticulated.

Hypural (?) No. 124 is the anterior detached portion of the most dorsal wide hypural (53). This bone receives, in the fossa on the ventral side, the anterior dorsal portion of the first broad hypural (53) and articulates with the hypural vertebra (34) ventrally and with the neural spine (51) lying in front. With the neural spine (51) just in front, it forms an arch dorsad of the body of the hypural vertebra (34). Plate

I illustrates it still articulated, while Plate XII, fig. 1, represents it detached.

Rays of caudal fin No. 54 articulate with the posterior ends of the hypurals (53) clasping around them and on the dorsal side with the neural spines (51) of the 2 vertebræ immediately preceding the hypural vertebra (34). On the ventral side they articulate with the hæmal spines (52) of 3 caudal vertebræ immediately preceding the hypural vertebra (34). (Plate I.) No. 55 is used in Plate I to indicate the caudal rays at the dorsal side. These are short, those in the median region being the longest, the fin being homocercal.

#### RIBS

Articulated with the atlas and axis is a pair of single ribs. Posterior to these are about 15 pairs of double ribs, while posterior to these there is a pair of single ribs articulated with each of the vertebræ except the last 5 in the caudal region. In the last 4 pairs of double ribs the more dorsal is articulated to the transverse process, not at the place with the ventral, but slightly proximally, and so may be designated epipleurals. The last 3 double ribs in Plate I show this condition.

Rib 48 is in the anterior abdominal region in Plate I.

Rib 50 is attached to the 28th vertebra as shown in Plate I.

Rib 56 is in the posterior abdominal region, and is articulated with the 38th vertebra. (Plate I.)

Ribs 59 are the ventral of the first 3 double ribs, those of the right side lying above. They are articulated with the 3d, 4th, and 5th vertebræ, respectively.

Ribs 61 are the dorsal of the first 3 double ribs. These are articulated with the 3d, 4th, and 5th vertebræ. (Plate XII, fig. 2.)

The 13th upper double rib (104). All of these ribs at the bottom are of the left side of the body, and those at the top of the right side. Plate XII, fig. 2.

The 13th lower double rib (105) is seen in Plate XII, fig. 2.

The 14th upper double rib (106) is seen in Plate XII, fig. 2.

The 14th lower double rib (107). Anteriorly to this point, the dorsal ribs have been the longer. (Plate XII, fig. 2.)

The 15th upper double rib (108). Here the lower instead of the upper double rib is the longer. (Plate XII, fig. 2.)

The 15th lower double rib (109) is in Plate XII, fig. 2.

The 25th rib (110) of the trunk is a single rib, and is illustrated in Plate XII, fig. 2.



The 26th rib (111) of the trunk is shown in Plate XII, fig. 2.

The 39th rib of the trunk (112), a single rib, is illustrated in Plate XII, fig. 2.

The 40th rib (113) is shown in Plate XII, fig. 2.

The 41st rib (114) is represented in Plate XII, fig. 2.

## VI. HYOID APPARATUS

### PLATE XIII

Plate XIII shows the hyals from the outside, except the urohyal (68), which is seen from the ventral side. On the left side of the plate the hypohyal (84), the ceratohyal (19), and the epihyal (20) are shown articulated, while on the right side they are shown disarticulated.

The ceratohyal (19) is shown in the natural size, the anterior end being 4.5 millimeters in thickness and the posterior end 3 millimeters. Along the exteroventral margin is a fossa for the articulation of the branchiostegals (22).

The flange on the ceratohyal is seen not to be continuous with that of the epihyal (20). The first and second branchiostegals (22) are articulated with the ceratohyal, and the end of the third is opposite the V-shaped opening on the ventral side between the pterygoid (80) on the outside and the urohyal (68) on the inside. The ends are much splintered, especially the posterior end. These are also seen from the dorsal side in Plate XV.

The outline of the epihyals (20) is clearly seen in Plate XIII. The ventral side has a wide flange similar to that on the ceratohyals (19) for the articulation of the branchiostegals (22). The posterior end has a condyle 4 millimeters thick. The anterior end is splintered with a very large process or "splinter" on the ventral side, which fits into a fossa in the posterior end of the ceratohyal (19).

The end of the third branchiostegal ray overlies the V-shaped interruption between the ceratohyals (19) and the epihyals on the ventral side, and the 4th and 5th rays articulate with the flange of the epihyals. Dorsally, at the extreme posterior end, the epihyals articulate with the ventral end of the interhyals (21). The epihyals lie opposite the posterior end of the quadrates (7), the ventral end of the preopercles (11), and the dorsal anterior portion of the interopercles (40). The dorsal portion of the extreme posterior end lies at the side of the

ceratobranchials (63) of the first branchial arch. In Plate XIII the exterior side of the bones is shown at the right and left sides. They are also seen from the dorsal side in Plate XV.

In Plate XIII the anterior side of the interhyals (21) lies in view. The condyle of the ventral end is larger than that of the dorsal end, and articulates with the glenoid fossa of the epihyals (20). The epicondyle, which here lies below, in its natural position is toward the interior. That of the left side is indistinctly seen in Plate XV.

The branchiostegals (22) are seen from the exterior and are curved as shown in Plate XIII. The anterior two articulate with the ceratohyals (19), the 3d lies over the V-shaped in-

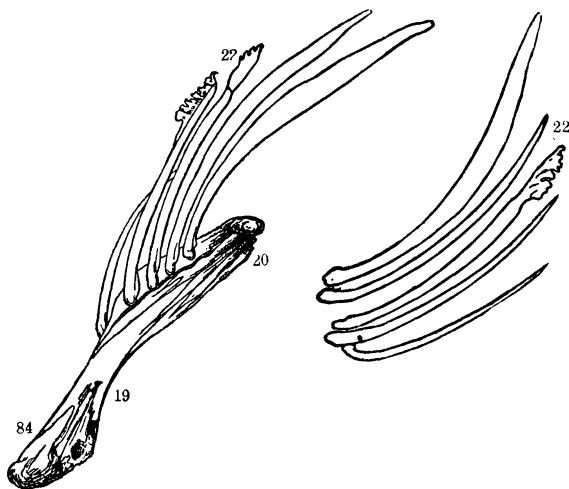


FIG. 3. Hypohyals (84), ceratohyals (19), epihyals (20), and branchiostegal rays (22). "Teeth" are found on some of the rays. Natural size.

terval between the ceratohyals (19) and the epihyals (20), and the 4th and 5th articulate with the epihyals (20). They lie opposite the inner surfaces of the interopercles (40), the subopercles (13), and the opercles (14). In one specimen examined, the 2d and 3d branchiostegals on the right side are seen to be notched or toothed as shown in text fig. 3, and on the left side the third is of like structure. In Plate XI the branchiostegals are in position, and the extended epibranchials (64) and superior pharyngeals (23) are underneath the posterior ends. Plate VI, fig. 1, shows those of the left side from the interior.

From the ventral side the urohyal (68) presents a flat, somewhat oval surface, with a posterior spinous portion. However,

the median line and the seeming posterior portion indicate the presence of a dorsal lamellar flange at right angles to the part shown. The anterior view shows the urohyal to be somewhat like an inverted  $\tau$  seen in text fig. 4. Anteriorly, both the horizontal and vertical lamellæ are thickened, so that the anterior end is of the shape shown in the figure. It articulates by the anteroventral fossa with the ventral side of the second basibranchial (17). Laterally and anteriorly it lies between, and articulates with, the hypohyals (84) and continues posteriorly between the ceratohyals (19) and the branchiostegals (22). (Plates VI and XIII.)

The hypohyals (84) articulate with each other just anterior to the urohyal (68) and with the anterior portion, both horizontal and vertical, of the urohyal. Posteriorly they articulate with the ceratohyals (19). Dorsally they articulate with the first basibranchial (17) and also with the ventral vertical ridge of the same. On the left side the hypohyal is still articulated with the ceratohyal (19), while on the right side the right hypohyal is disarticulated. These are seen from the outer side. In Plate XV the posterodorsal condyles articulate with the second basibranchial (17) internally. The hypohyals are perforated with sensory canals. These are illustrated in Plate VI, fig. 1, and Plates XIII and XV.

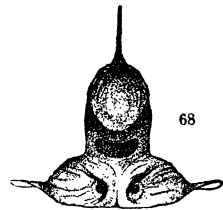


FIG. 4. Urohyal (68),  
anterior view.  $\times 3$ .

#### VII. DORSAL RAYS AND INTERNEURAL SPINES AND ANAL RAYS AND INTERHÆMAL SPINES

The interneural spines and the interhæmal spines articulate with the dorsal rays and anal rays, respectively, by ball-and-socket joints. Between the two lateral parts of the rays at the proximal ends are situated small spherical bodies (cartilaginous nodules) which fit into the sockets at the distal ends of the spines. In Plate XIV one of those posteriorly in the anal fin is seen disarticulated and others in both fins are plainly visible. Certain of the rays in both dorsal and anal fins present the posterior view, which shows the two lateral parts of the rays, their partial separation at the proximal end, and the cartilaginous nodules lying between their proximal ends.

All of both the interneural and interhæmal spines are represented from the left side, the left side of the plate being anterior. The posterior dorsal rays are not represented.

The form, outline, and articulation of the dorsal rays and the interneural spine, as well as the same characters of the anal rays and interhæmal spines, are shown in text fig. 5.

The interneural spines (44) of the anterior abdominal region are illustrated in Plate I, and in Plate XIV they are disarticulated.

Dorsal ray (45). In Plates I and XIV this number indicates the 8th dorsal ray, shown from the left side.

Dorsal ray (116). This is the second, and is seen in Plates I and XIV.

The 6th ray of the dorsal fin (121) is indicated in Plates I and XIV. In the latter plate it is exposed from the posterior side, while in Plate I it is still articulated and is in the natural position.

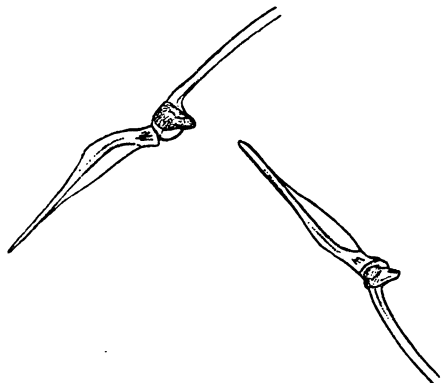


FIG. 5. Dorsal ray, interneural spine, anal ray, interhæmal spine, and cartilaginous nodules. The nodules are seen between the rays and spine.  $\times 1.5$ .

The interhæmal spine (57) is in the posterior abdominal region. The first spine in this series is almost straight, with a condyle at its ventral extremity to articulate with the anal ray. In the others there is an anterior vertical fossa, while the posterior portion is lamellar. No. 117. This is illustrated in Plates I and XIV. Interhæmal spines (117).

The 19th and 20th spines are indicated by this number in Plates I and XIV, being situated in the posterior abdominal region.

Rays of the anal fin (58). This number in Plates I and XIV represents one of the anal rays from the posterior side, showing the two lateral portions and the cartilaginous nodule between their distal ends.

Interneural spines (82). The spines indicated by this number, 82, in Plates I and XIV are in the posterior abdominal region. In Plate XIV the dorsal rays in this region are not represented, but they are present in Plate I.

Anal ray (118). The 3d anal ray in Plates I and XIV bears this number.

The 24th anal ray is labeled 119 in Plates I and XIV.

Anal rays 4 to 11 are indicated by number 120 in Plates I and XIV. Those in Plate XIV are viewed from the posterior

side, except the 5th, which presents the left side and shows no cartilaginous nodule. They lie opposite the corresponding inter-hæmal spines.

#### VIII. BRANCHIAL APPARATUS

##### PLATES XV AND XVI

Basibranchials (17). These are clearly illustrated in Plates XV and XVI, in the former articulated, and in the latter disarticulated, but contiguous to those bones with which they are articulated.

The 1st is thickest at the posterior end, where it is not quite as thick as wide. A slight ridge extends from the anterior to the posterior end on the ventral side.

The 2d is seen from the dorsal side, but, as the bone is rather deep, a profile drawing from the left side is shown in text fig. 6.

The 3d is about two-thirds as thick as broad, and has fossæ at the articulations of the hypobranchials (24) of the second branchial arch and also at the posterior end.

The 4th basibranchial has a shaft posteriorly, becomes thinner, and just posterior to the middle widens out into 2 thin lateral flanges. Anteriorly, it is broadly wedge-shaped.

Hypobranchials (24) of the first arch. The outline of the hypobranchials of the first arch is shown in Plate XVI, except the epicondyle of the interior end. The dorsal portion of the interior end articulates with the lateral fossa of the 3d basibranchial (17). The epicondyle passes to the ventral side of the 3d basibranchial (17) and forward, articulating with the posterior ventral portion of the 2d basibranchial (17). The anterior process is almost lamellar. Laterally and distally these hypobranchials articulate with the ceratobranchial (63). The anterolateral margin is covered with small detachable plates of cardiform teeth (133) which take the place of gill rakers.

Hypobranchials of the 2d arch. These bones articulate distally with the ceratobranchials (63). Proximally the articulation is with the fossæ of the 4th basibranchial (17), the posteroventral margin of the 3d basibranchial, and with the anteroventral process of the hypobranchials of the 3d branchial arch. They are convex anterodorsally and concave posteroventrally. The ventral anterolateral epicondyle is lamellar. The anterolateral surface is covered with detachable plates of cardiform teeth.

Hypobranchials of the 3d arch. The outline is clearly seen in Plate XVI. Medially and posteriorly they articulate with

the ceratobranchials (63) of the 4th arch, the posterodorsal portion of the 4th basibranchial (17), and the hypobranchials of the 3d arch on the opposite side. Distally they articulate with the ceratobranchials (63) of the 3d arch. The anterior process articulates with the proximal ventral epicondyle of the hypobranchials of the 2d branchial arch and with the anterior process of the hypobranchials of the 3d arch on the opposite side.

Unlike other hypobranchials, those of the 3d arch have areas of cardiform teeth on the posterodorsal side which are firmly fixed and not detachable. Also, these areas are much larger than the detachable areas of the other hypobranchials and modified epibranchials (74) of the 1st branchial arch. There are no hypobranchials in the 4th branchial arch.

In Plate XV the hypobranchials are still articulated, and are shown from the dorsal side.

Upper or superior pharyngeals (23). These are designated by 23<sup>2</sup>, 23<sup>3</sup>, 23<sup>4</sup>, referring to the different branchial arches, 23<sup>2</sup> articulates with the epibranchial (64) of the 2d arch, 23<sup>3</sup> articulates with the epibranchial (64) of the 3d arch, and 23<sup>4</sup> articulates with the epibranchial (64) of the 4th arch. In Plates XV and XVI the upper pharyngeals are shown moved outwardly and posteriorly, together with the epibranchials (64), on the articulation of the epibranchials and the ceratobranchials (63) as a hinge. In the latter plate they are not articulated, while they are in the former. In their natural position the upper pharyngeals lie dorsad of the inferior pharyngeals (25), so that their toothed surfaces lie together. The upper pharyngeals of the 2d and 3d arches and the epibranchials (64) of the 2d arch articulate with the ventral side of the basioccipital (69).

In some specimens examined, certain of the teeth of the superior pharyngeals of the 4th arch were seen to be growing from the sides of large sockets, presumably of larger, more mature teeth already shed.

Lower or inferior pharyngeals (25). These are articulated anteriorly and laterally with the ceratobranchials (63) of the 4th branchial arch, the posterodorsal portion lying interior to the ceratobranchials (63). As seen in Plate XVI, they are provided with teeth which increase in size posteriorly. They are very small anteriorly and very large posteriorly. Along the posterior margin small teeth are seen in large sockets—the same condition existing as is described in No. 23. Plate VI, fig. 1, and Plates XV and XVI illustrate these.

Ceratobranchials (63). These are concave below and convex above. The condyles or glenoid surfaces of the proximal ends are much larger than those of the distal ends. All are at least slightly concave. Those of the 1st, 2d, and 3d branchial arches articulate with the hypobranchials (24) proximally and distally with the epibranchials (74) of the 1st branchial arch and (64) of the 2d and 3d branchial arches. As there are no hypobranchials (24) of the 4th branchial arch, the ceratobranchials of this arch articulate proximally with the hypobranchials (24) of the 3d branchial arch, the 4th basibranchial, and the proximal end of the inferior pharyngeals (25). Distally the articulation is with the distal end of the epibranchials (64) of the 4th branchial arch. All of the ceratobranchials are covered, on the convex surface, with detachable patches of cardiform teeth, the same as are spoken of in the descriptions of the hypobranchials (24) and the epibranchials (74) of the 1st branchial arch. The margins of the concavity on the ventral side of each of the ceratobranchials are fringed with branchial lamellæ. (Plates XV and XVI.)

Epibranchials (74) of the first branchial arch. These bones form a part of the accessory branchial apparatus. Each consists of a dorsal vertical portion, about two-fifths of the total length, which articulates dorsally with the margin of the flat ventral portion of the pterotic (38), where the pterotic forms a part of the roof of the accessory branchial chamber. Continuous with the dorsal spinous portion and at the internal angle of the more ventral lamellar part is a thickening or reënforcement which becomes thicker at the ventral end where this epibranchial articulates with the ceratobranchial (63) of the first branchial arch. The lower portion is lamellar, with a broad internal more ventral part at an angle of about 60 degrees to an external lateral portion, which extends farther dorsally into the accessory branchial chamber. Ventrally the broad edge of the posterior portion and the narrow ventral part of the flange at an angle are continuous with the posterolateral end of the first ceratobranchial (63), helping to form the first branchial arch. The whole ventral margin and, also, the ventral part of the interior angle are provided with the detachable patches of cardiform teeth (133), as in the ceratobranchials (63) and the hypobranchials (24). In Plate VI, fig. 1, the right is seen from the outer side, in Plate XVI both are seen from the inner side, disarticulated, and in Plate XV the left is but indistinctly seen.

Epibranchials (64) of the 2d branchial arch. These artic-

ulate distally with the ceratobranchials (63) of the 2d branchial arch and with the ventrolateral region of the basioccipital (69) and the superior pharyngeals (23<sup>2</sup>) of the 2d branchial arch internally and ventrally, respectively. Because of being



FIG. 6. Glossohyal (65); basibranchials (17) of the 1st, 2d, and 3 branchial arches from the left side; the basibranchial of the 2d arch in detail.  $\times 2$ .

extended, the ventral instead of the dorsal surface is shown. The dorsal surface is concave, with the outside of the curve, the region of the epicondyle, lying anteriorly and dorsad of the ceratobranchials (63) and the anterior portion of the inferior pharyngeals (25). The proximal or internal condyle or that which articulates with the basioccipital (69) is much larger than that which articulates with the ceratobranchials (63) of the 2d branchial arch.

Epibranchials of the 3d branchial arch. These bones also are seen from the ventral side. The articulations distally are with the ceratobranchials of the 3d branchial arch and proximally with the superior pharyngeals (23<sup>3</sup>) of the 3d arch. The two epicondyles shown at the top in Plate XVI lie dorsad in position against the anterior surface of the epibranchials of the 4th arch. The large condyle articulates with the dorsal surface of the superior pharyngeals (23<sup>4</sup>) of the 4th branchial arch.

The epibranchials are seen in Plates XV and XVI.

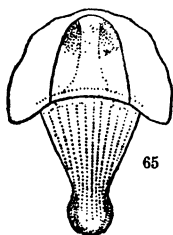


FIG. 7. Glossohyal (65), dorsal view, showing the more solid central portion.  $\times 1.5$ .

Glossohyal (65). The more solid central portion of the glossohyal is shown articulated with the anterior end of the first basibranchial (17). The complete outline is shown in text fig. 7, the central, more solid portion being indicated. The glossohyal in small specimens is entirely cartilaginous, with the anterior and lateral margins much softer than the central portion. The drawing

is the actual size of the glossohyal from a different fish from that of Plate XVI. In Plate XV the glossohyal has been removed. (Plate XVI.)

This number (133) in Plate VI, fig. 1, and in Plate XV in-



dicates detachable plates of cardiform teeth found on the branchial arches.

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## ILLUSTRATIONS

Plates from photographs by Day and Martin; text figures from drawings by Espinosa. The species represented in all of the plates and the text figures is *Ophiocephalus striatus* Bloch.

### PLATE I

The whole skeleton, articulated; from the left side.

#### PLATE Ia

Anterior part of skeleton, natural size.

#### PLATE Ib

Middle part of skeleton, natural size.

#### PLATE Ic

Posterior part of skeleton, actual size.

### PLATE II

The top of the skull from the dorsal side.

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- 76, prefrontals, from the dorsal side.
- 78, proötics, left from dorsal side and right from ventral.
- 81, ethmoid, from the dorsal side.
- 83, basisphenoid, from the dorsal side.
- 122, alisphenoid, right from the ventral side.

## PLATE IV

FIG. 1. Posterior portion of disarticulated skull. The left side of the figure is anterior.

- |   |                   |
|---|-------------------|
| 35, supraoccipital, from the dorsal side.                       |                   |
| 69, basioccipital, from the dorsal side.                        |                   |
| 72, exoccipitals, from the dorsal side.                         |                   |
| 79, epiotics, left from ventral side and right from dorsal.     |                   |
| 123, opisthotics, left from ventral side and right from dorsal. |                   |
| 2. Top of skull from right side.                                |                   |
| 36, frontal.  | 72, exoccipital.  |
| 38, pterotic.   | 76, prefrontal.   |
| 39, sphenotic.  | 78, proötic.      |
| 66, parasphenoid.   | 79, epiotic.      |
| 67, vomer.  | 83, basisphenoid. |
| 69, basioccipital.  |                   |

## PLATE V

FIG. 1. Ventral side of top of skull.

- |                                    |                   |
|------------------------------------|-------------------|
| 35, supraoccipital.                | 72, exoccipital.  |
| 36, frontal.                       | 76, prefrontal.   |
| 38, pterotic.                      | 78, proötic.      |
| 39, sphenotic.                     | 79, epiotic.      |
| 66, parasphenoid.                  | 83, basisphenoid. |
| 67, vomer.                         | 122, alisphenoid. |
| 69, basioccipital.                 | 123, opisthotic.  |
| 2. Posterior view of top of skull. |                   |
| 35, supraoccipital.                | 72, exoccipital.  |
| 38, pterotic.                      | 79, epiotic.      |
| 69, basioccipital.                 | 123, opisthotic.  |

## PLATE VI

FIG. 1. Right side of skull with suspensorium and jaws removed.

- |   |   |
|---|---|
| 1, premaxillary.  | 65, glossohyal.                                   |
| 13, suboperculum.   | 66, parasphenoid.                                 |
| 14, operculum.  | 67, vomer.  |
| 16, nasal.  | 68, urohyal.                                      |
| 22, branchiostegals.  | 70, atlas.  |
| 25, lower or inferior pharyngeals.  | 72, exoccipital.                                  |
| 26, supratemporal.  | 74, epibranchial, modified of 1st branchial arch. |
| 27, posttemporal.   | 76, prefrontal.                                   |
| 36, frontal.  | 78, proötic.                                      |
| 38, pterotic.   | 84, hypohyal.                                     |
| 39, sphenotic.  | 123, opisthotic.                                  |
| 40, interoperculum.   | 133, patches of cardiform teeth.                  |
| 2. Orbitals.  |   |
| 18 <sup>1</sup> to 18 <sup>5</sup> , suborbitals; 18 <sup>2</sup> , of top row from the posterior side. |   |
| 18 <sup>6</sup> , preorbital from outside.  |   |

## PLATE VII

Suspensorium, opercles, and palatine. All the bones of the right side are seen from the outside. Those at the top—articulated—are from a smaller specimen than those below.

2, palatine.	13, suboperculum.
7, quadrate.	14, operculum.
8, metapterygoid.	40, interoperculum.
9, symplectic.	71, mesopterygoid.
10, hyomandibular.	80, pterygoid.
11, preoperculum.	

## PLATE VIII

Suspensorium, opercles, and palatine. The bones of the left side seen from the inside.

2, palatine.	13, suboperculum.
7, quadrate.	14, operculum.
8, metapterygoid.	40, interoperculum.
9, symplectic.	71, mesopterygoid.
10, hyomandibular.	80, pterygoid.
11, preoperculum.	

## PLATE IX

The mandible.

- 1, premaxillaries, left from dorsal and right from ventral side.
- 3, dentaries, left from dorsal and right from outer side.
- 4, articulares, left from dorsal and right from outer side.
- 5, maxillaries, left from dorsal and right from ventral side.
- 12, angular, right from outer side.
- 86, intra-articulars from dorsal side.

## PLATE X

The girdles.

- 6, postclavicles; lower part, left from inside, right from outside.
- 15, hypercoracoid; left from inside, right from outside.
- 28, supraclavicles; left from inside, right from outside.
- 29, pectoral rays; left from inside, right from outside.
- 30, hypocoracoid; left from inside, right from outside.
- 31, actinosts; left from inside, right from outside.
- 32, pelvic girdle; from dorsal side.
- 33, pelvic rays; from dorsal side.
- 62, clavicles; left from inside, right from outside.
- 77, postclavicle; upper part, left from inside, right from outside.

## PLATE XI

## Anterior and median abdominal vertebræ.

- |                                   |  |
|-----------------------------------|--|
| 43, neural spine.                 | 97, centrum of vertebra, the 7th bearing No. 90.             |
| 46, transverse process.           | 98, centrum of vertebra, the 20th bearing No. 91.            |
| 47, transverse process.           | 99, centrum of vertebra, the 22d bearing No. 93.             |
| 49, transverse process.           | 100, centrum of vertebra, the last but seven bearing No. 94. |
| 70, atlas.                        | 101, centrum of vertebra, the last but five bearing No. 96.  |
| 87, axis.                         | 126, neural arch of vertebra, bearing Nos. 87, 88, and 94.   |
| 88, 5th vertebra.                 | 127, prezygapophyses.  |
| 89, 6th vertebra.                 | 128, postzygapophyses.                                       |
| 90, 7th vertebra.                 | 134, anterior ventral process.                               |
| 91, 20th vertebra.                | 135, posterior ventral process.                              |
| 92, 21st vertebra.                |  |
| 93, 22d vertebra.                 |  |
| 94, vertebra, the last but seven. |  |
| 95, vertebra, the last but six.   |  |
| 96, vertebra, the last but five.  |  |

## PLATE XII

## FIG. 1. Caudal vertebræ and hypurals.

- |                                    |                                      |
|------------------------------------|--------------------------------------|
| 34, hypural vertebra.              | 103, hypural.                        |
| 51, neural spine.                  | 124, upper anterior part of hypural. |
| 52, hæmal spine.                   | 129, last vertebra but four.         |
| 53, hypural.                       | 130, last vertebra but three.        |
| 60, anterodorsal spine of hypural. | 131, last vertebra but two.          |
| 102, hypural.                      | 132, last vertebra but one.          |
| 2. Ribs.                           |                                      |
| 59, ventral of double ribs.        | 107, lower double rib; the 14th.     |
| 61, dorsal of double ribs.         | 108, upper double rib; the 15th.     |
| 104, upper double rib; the 13th.   | 109, lower double rib; the 15th.     |
| 105, lower double rib; the 13th.   | 110, rib; the 25th.                  |
| 106, upper double rib; the 14th.   | 111, rib; the 26th.                  |
|                                    | 112, rib; the 39th.                  |
|                                    | 113, rib; the 40th.                  |
|                                    | 114, rib; the 41st.                  |

## PLATE XIII

## Hyoid apparatus.

- |                                |                                    |
|--------------------------------|------------------------------------|
| 19, ceratohyals, from outside. | 22, branchiostegals, from outside. |
| 20, epihyals, from outside.    | 63, urohyal, from ventral side.    |
| 21, interhyals, from outside.  | 84, hypohyals, from outside.       |



## PLATE XIV

- Interneural spines and dorsal rays and interhæmal spines and anal rays.
- |  |   |
|--|---|
| 44, interneural spine, anterior abdominal. | 117, 19th and 20th interhæmal spines.           |
| 45, dorsal rays.                           | 118, 3d anal ray.                               |
| 57, interhæmal spine.                      | 119, 24th ray of anal fin.                      |
| 58, anal rays.                             | 120, 4th to 11th anal rays.                     |
| 82, interneural spines.                    | 121, 6th ray of dorsal fin, from posterior end. |
| 116, second dorsal ray, from left side.    |   |

## PLATE XV

- Branchial arches, articulated.
- |                                    |  |
|------------------------------------|--|
| 17, basibranchials.                | 25, lower or inferior pharyngeals.                   |
| 19, ceratohyal.                    | 64, epibranchials.                                   |
| 20, epihyal.                       | 74, epibranchials, modified of 1st branchial arch.   |
| 21, interhyal.                     |  |
| 22, branchiostegals.               | 84, hypohyal.  |
| 23, upper or superior pharyngeals. | 133, patches of cardiform teeth on branchial arches. |
| 24, hypobranchials.                |  |

## PLATE XVI

- Branchial arches, disarticulated.
- |                                     |   |
|-------------------------------------|---|
| 17, basibranchials.                 | 63, ceratobranchials.                             |
| 23, upper, or superior pharyngeals. | 64, epibranchials.                                |
| 24, hypobranchials.                 | 65, glossohyal, central, more solid portion.      |
| 25, lower or inferior pharyngeals.  | 74, epibranchial, modified of 1st branchial arch. |

## TEXT FIGURES

- FIG. 1. Caudal vertebra, the last but 2 (131), anterior view.
- Atlas (70); axis (87); 3d, 4th, and 5th vertebræ; interneural spines; dorsal rays; and anterior dorsal radials (85 and 115).
  - Hypohyals (84), ceratohyals (19), epihyals (20), and branchiostegal rays (22). "Teeth" are found on some of the rays.
  - Urohyal (68), anterior view.
  - Dorsal ray, interneural spine, and ray, interhæmal spine, and cartilaginous nodules. The nodules are seen between the rays and spines.
  - Glossohyal (65); basibranchials (17) of the 1st, 2d, and 3d branchial arches from the left side; the basibranchial of the 2d arch in detail.
  - Glossohyal (65), dorsal view, showing the more solid central portion.



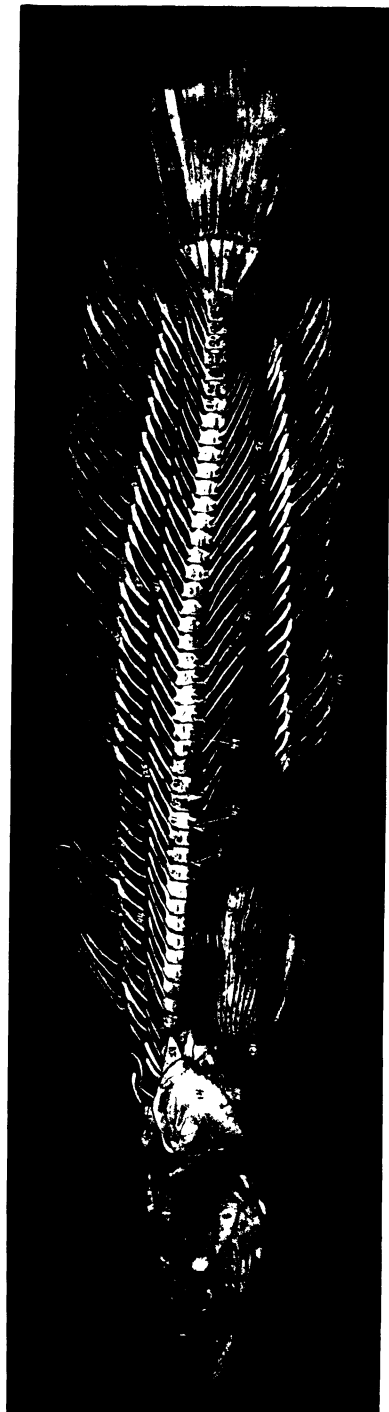


PLATE I. OPHIOCEPHALUS STRIATUS. THE WHOLE SKELETON, ARTICULATED, FROM THE LEFT SIDE.

U of M





PLATE I A.



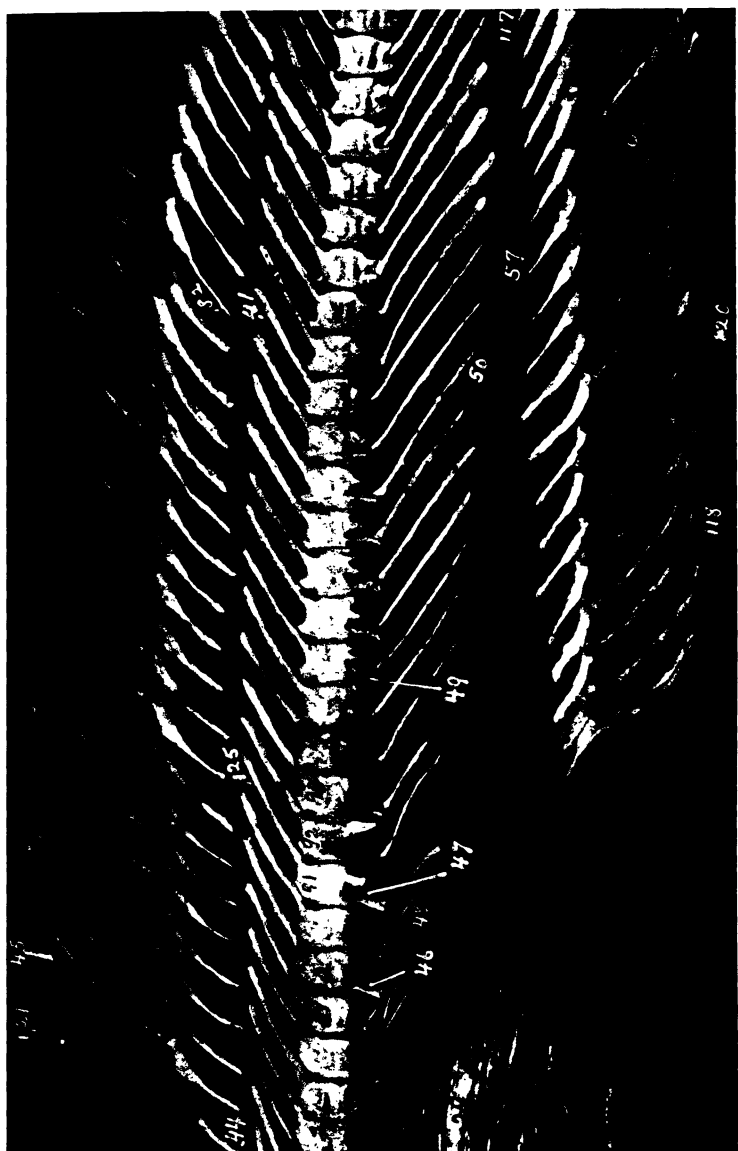


PLATE I B.







PLATE I C.





PLATE II. THE TOP OF THE SKULL FROM THE DORSAL SIDE.



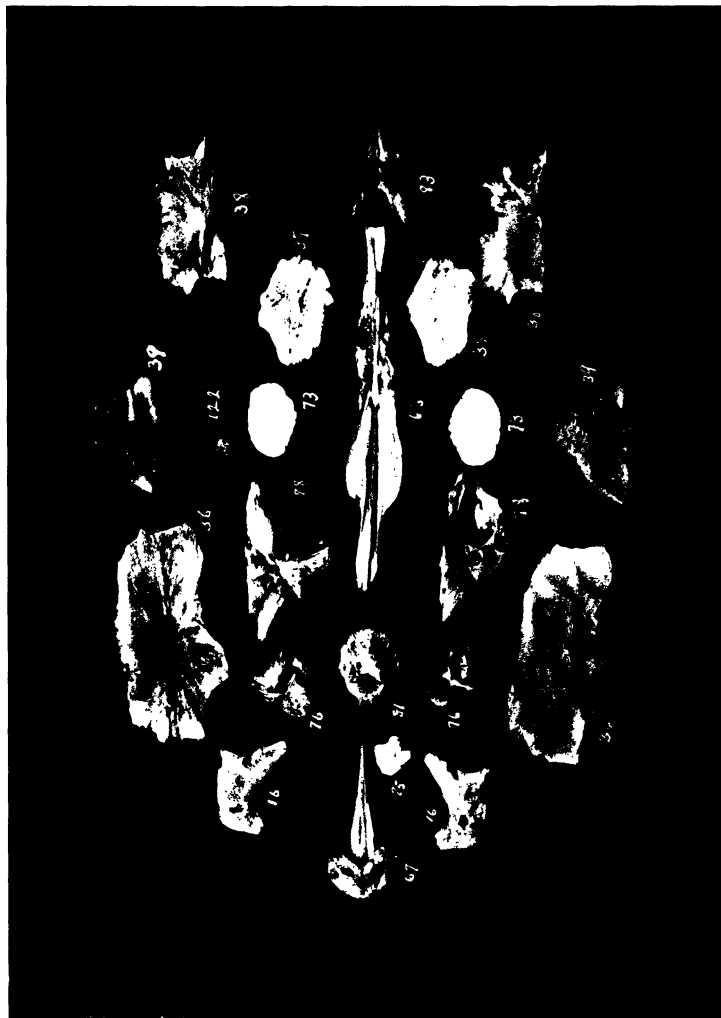


PLATE III. A PART OF THE DISARTICULATED SKULL.



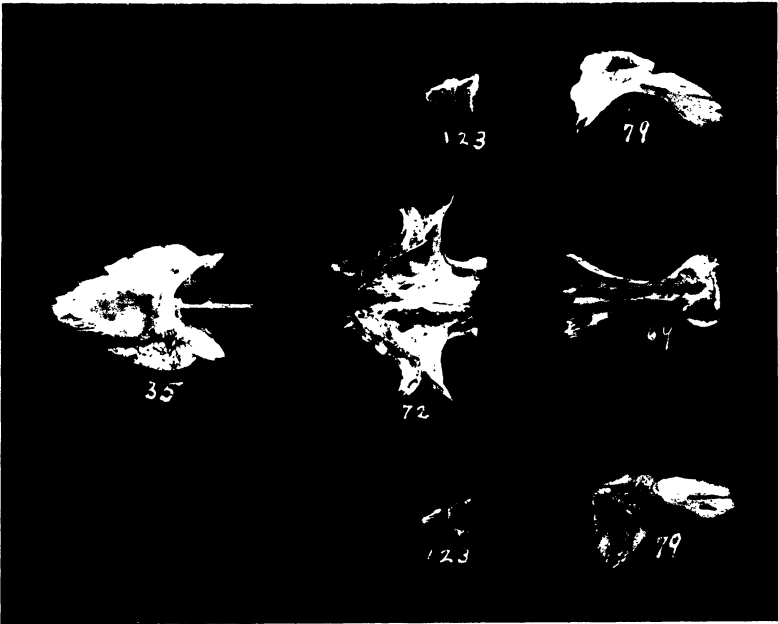


Fig. 1. Posterior portion of disarticulated skull.

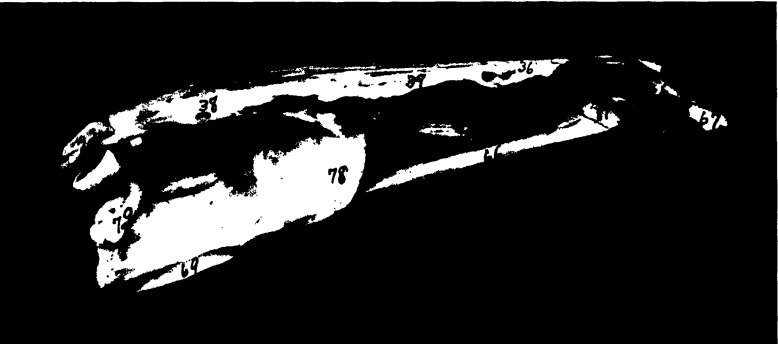


Fig. 2. Top of skull from the right side.

PLATE IV.





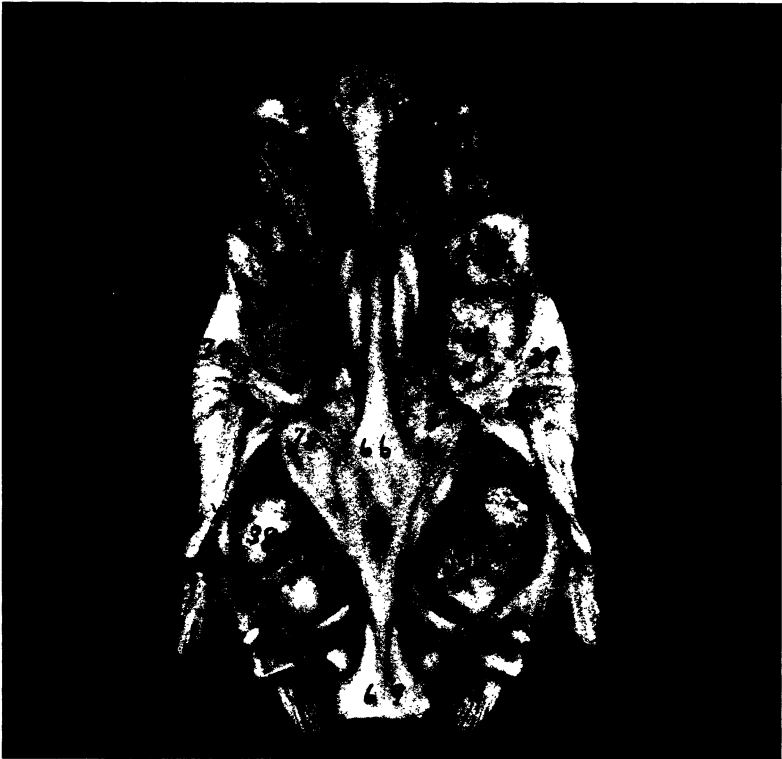


Fig. 1. Ventral side of top of skull.



Fig. 2. Posterior view of top of skull.

PLATE V.





Fig. 1. Right side of skull with suspensorium and jaws removed.

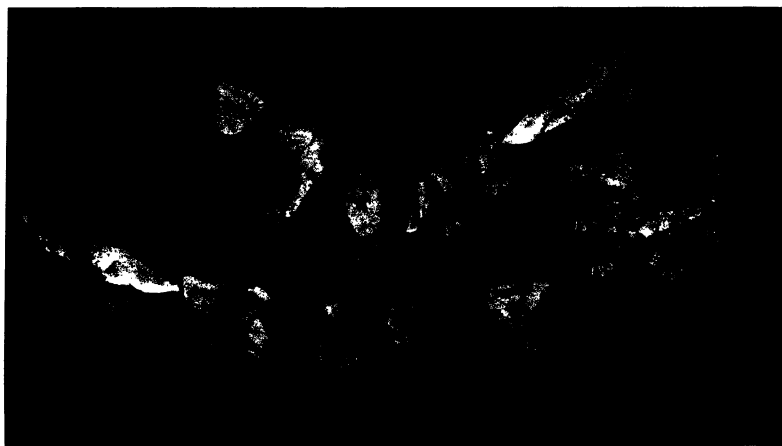


Fig. 2. Orbitals.

PLATE VI.





PLATE VII. SUSPENSORIUM, OPERCLES, AND PALATINE.





PLATE VIII. SUSPENSORIUM, OPERCLES, AND PALATINE.





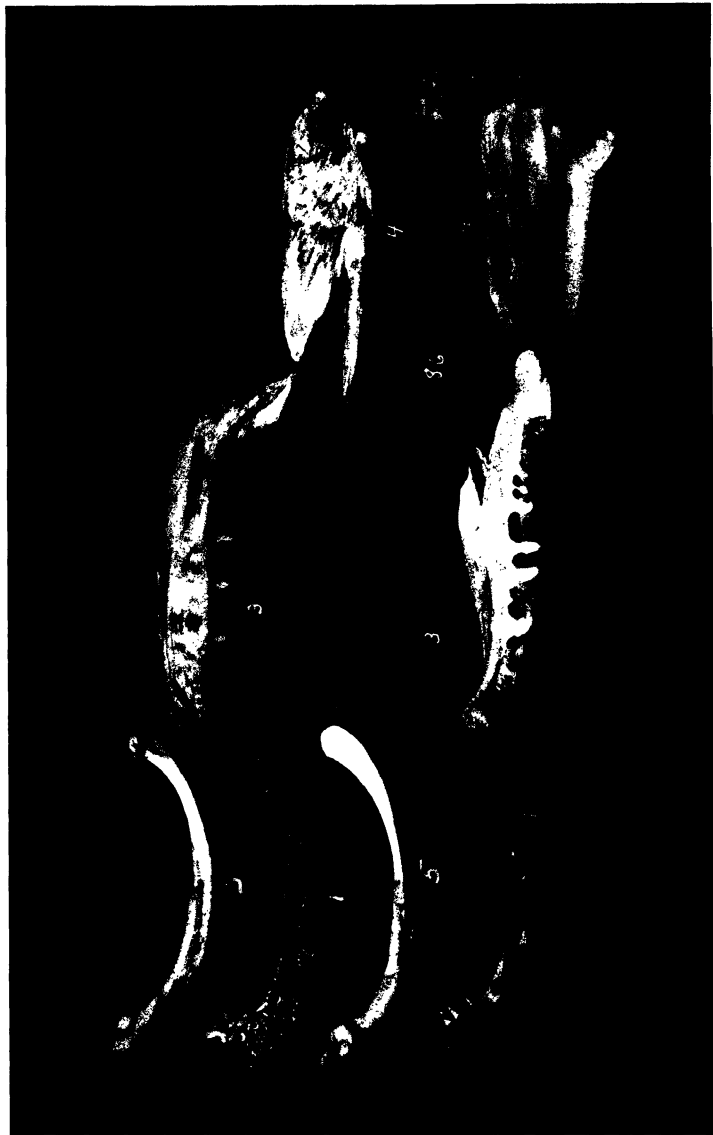


PLATE IX. THE MANDIBLE.





PLATE X. THE GIRDLES.



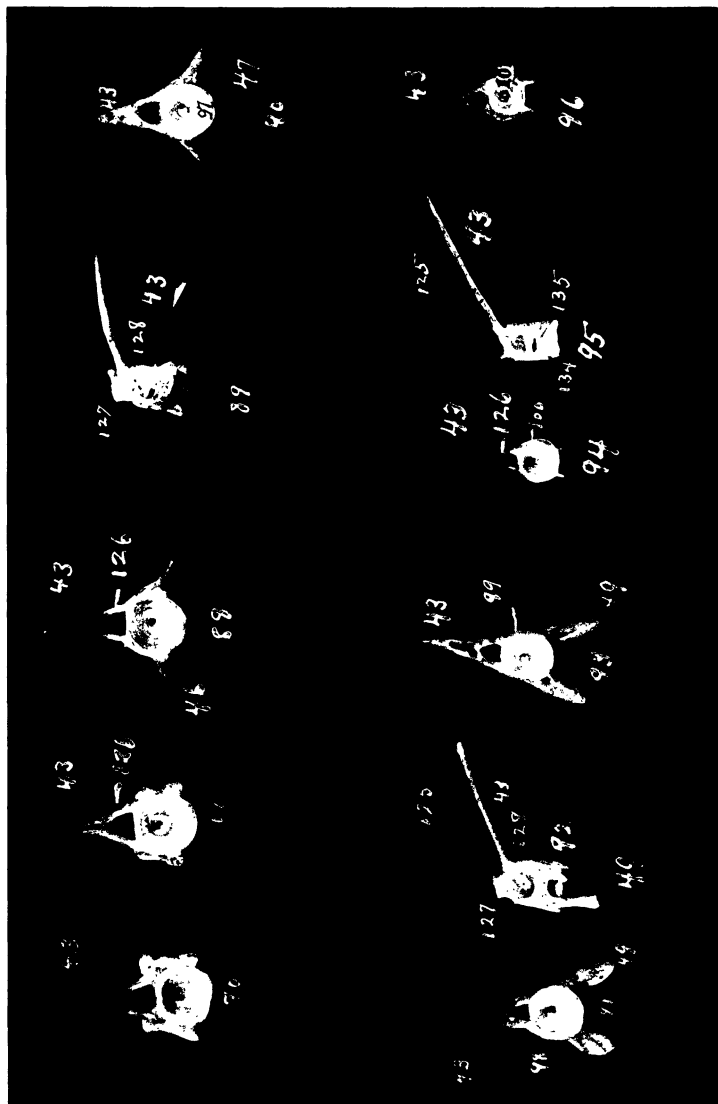
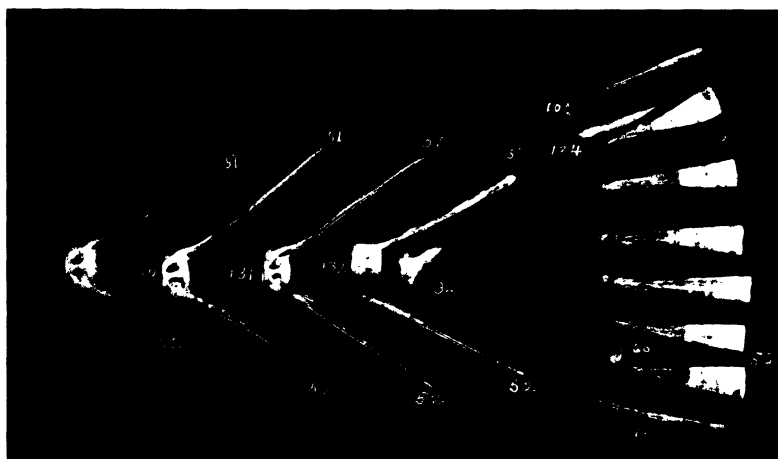
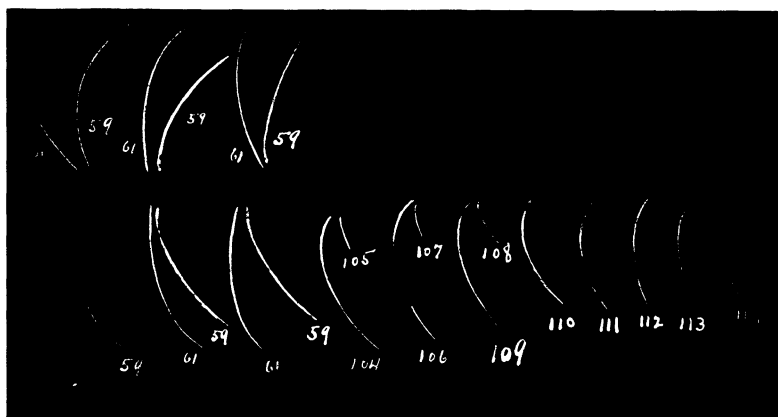


PLATE XI. ANTERIOR AND MEDIAN ABDOMINAL VERTEBRÆ.





**Fig. 1. Caudal vertebræ and hypurals.**



**Fig. 2. Ribs.**

PLATE XII.







PLATE XIII. HYOID APPARATUS.



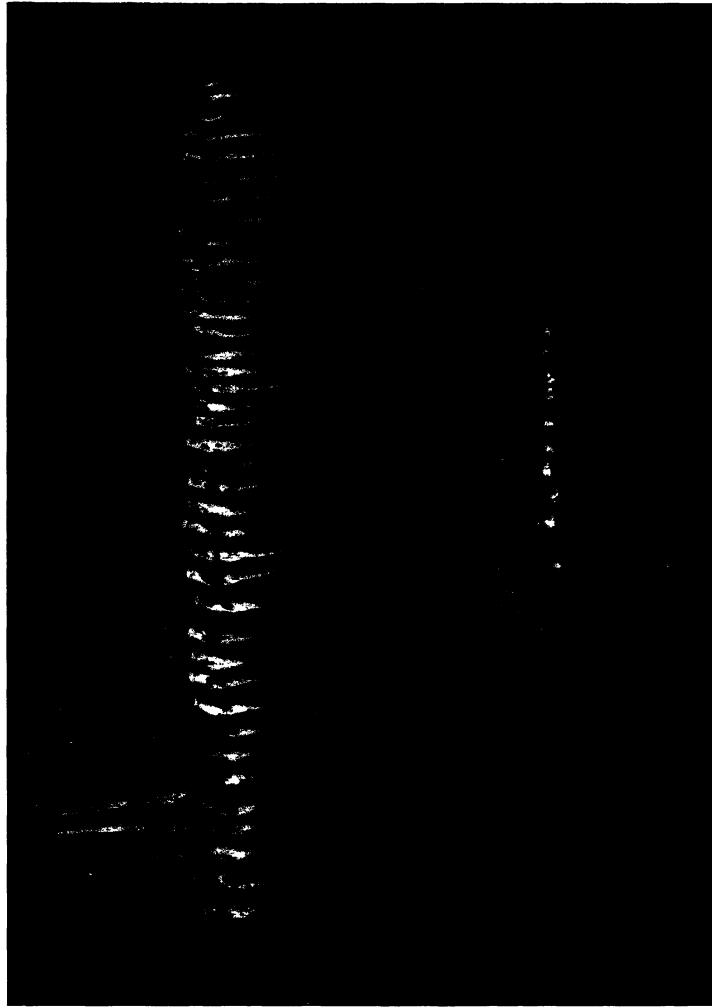


PLATE XIV. INTERNEURAL SPINES AND DORSAL RAYS AND INTERHÆMAL SPINES AND ANAL RAYS.



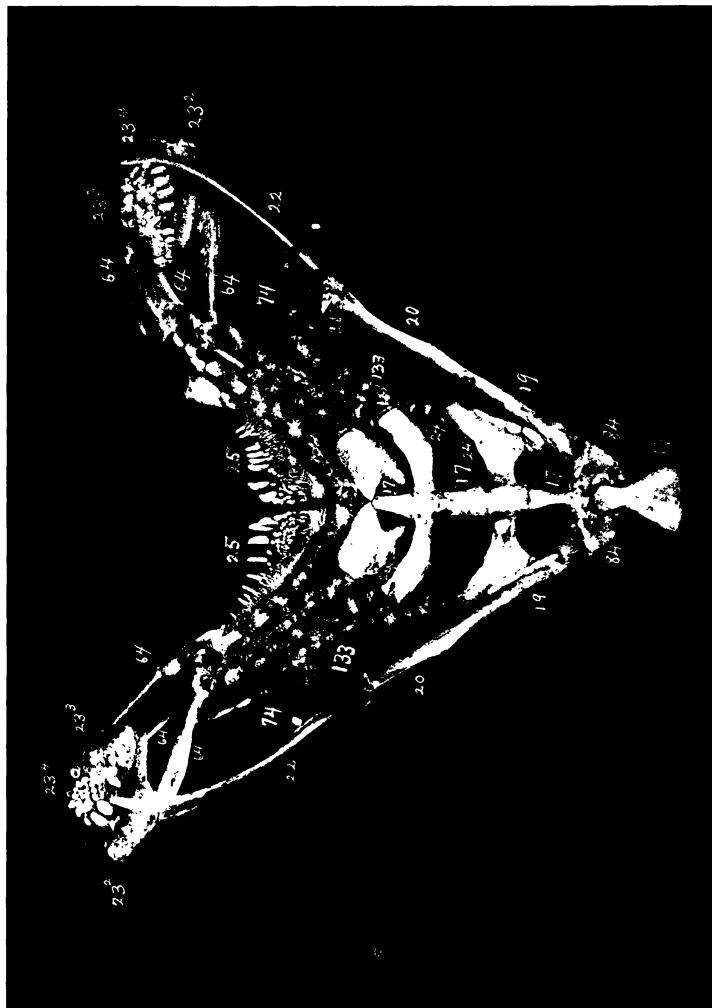


PLATE XV. BRANCHIAL ARCHES, ARTICULATED.



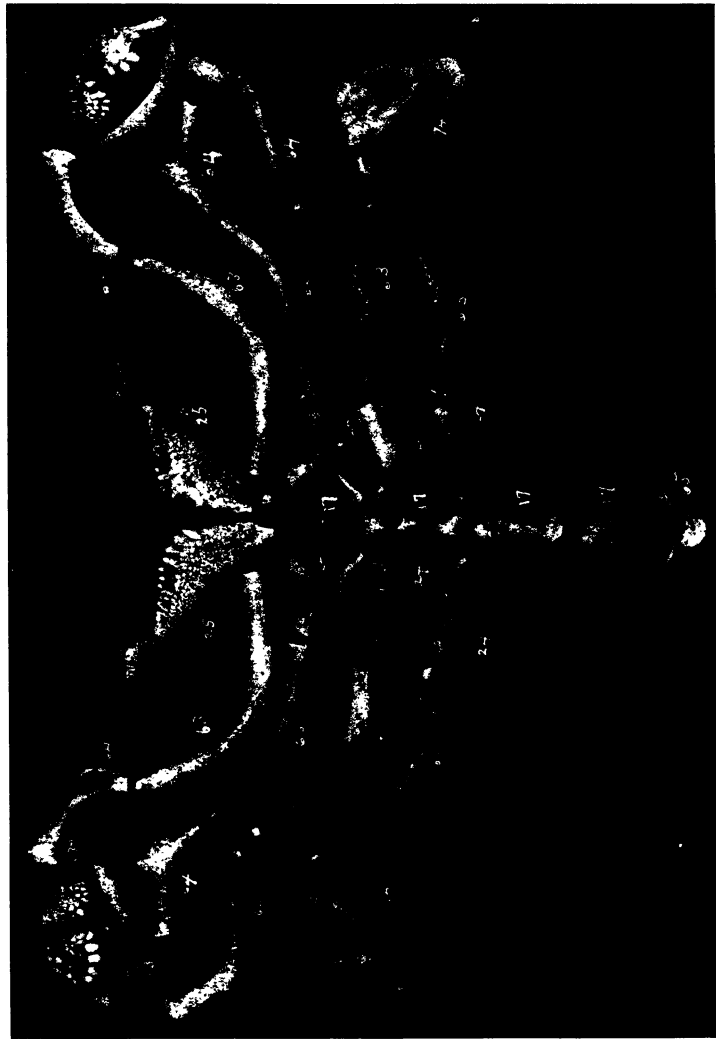


PLATE XVI. BRANCHIAL ARCHES, DISARTICULATED.





## NOTE ON THE OCCURRENCE OF A FLYING CRUSTACEAN IN THE PHILIPPINE ISLANDS

By DEAN C. WORCESTER

(*Manila, P. I.*)

While fishing along the base of a limestone cliff in Bacuit Bay, Palawan, during the month of December, 1912, I saw close to my launch what I at first mistook for a peculiarly formed flying fish of some species which I had never previously observed. It was translucent, rose from the water somewhat sharply, and "flew" not more than two or three rods before dropping into the water again.

The more I pondered on what I had seen the more it seemed to me that the creature could not be a fish. It had looked more like a crayfish or shrimp, with one or two pairs of much flattened legs directed forward and others curving backward, the legs and the lobes of the tail making the supporting planes.

On the evening of August 15, 1913, when trolling off the edge of the shoal extending in a southeasterly direction from East Island near the coast of Palawan, I again saw the same sort of a creature, and this time there was no mistaking it. It rose close to the boat, mounted into the air rapidly, then held a level course for a short distance, and dropped suddenly into the water again. It was unquestionably a very transparent crustacean, from 15 to 20 centimeters in length.

On the morning of August 17, when trolling off the shoal on the north side of Lumbucan Island, I saw a third specimen, and later in Malampaya Sound I saw a fourth. At this place Mr. W. Schultze, of the Bureau of Science, also saw one, and there remains no doubt of the existence in the Philippines of a marine crustacean, from 15 to 25 centimeters in length, which has the power of rising rapidly from the water and "flying," after the fashion of a flying fish, for several rods.

The specimens observed by me invariably rose against the wind.



## FISHES OF HONGKONG

By ALVIN SEALE

(From the Section of Ichthyology, Biological Laboratory, Bureau of Science, Manila, P. I.)

Two plates

The following notes are based on a collection of fishes secured by me from the markets in Hongkong during the month of August, 1910. The native names of the fishes are copied from the Hongkong Official Market Report of April 28, 1910. With but few exceptions the species here listed are used as food by the people of Hongkong.

The measurements given are: 1, length of head in length of fish without caudal; 2, greatest depth in length to last caudal vertebra; 3, length of head, exclusive of opercular flap, in length of fish without caudal. The scale count is from head to last caudal vertebra; total length is taken from tip of snout to tip of caudal fin. The numerals given at the end of each description are the numbers of the specimens in the collection of the Bureau of Science, Manila.

### ENGRAULIDÆ. (Anchovies)

*Anchovia dussumieri* Cuv. and Val.

This species is characterized by the elongate posterior extension of the maxillary which ends on a line with the anterior third of the ventral fins. (6398.)

*Anchovia indica* (Van Hasselt).

*Engraulis russelli* GÜNTHER.

Dorsal, 15; anal, 19; length, 5.5 to end of vertebra; 3 or 4 elongate spines on belly in front of ventrals. (6393, 6394, 6397, 6399, 6400, 6401, 6402, 6403, 6404, 6405, 6407.)

### SYNODONTIDÆ. (Lizard fishes)

*Trachinocephalus myops* (Forster).

One specimen. (6595.)

*Synodus japonicus* (Houttuyn).

(6573, 6590, 6592, 6615, 6653, 6665.)

## CYPRINIDÆ. (Carp, li yu)

*Cyprinus carpio* (Linn.).

Six specimens of the common carp were secured. This fish is extensively cultivated in Canton and brought alive to the Hongkong markets where it is kept in large fresh-water tanks. The Chinese seem to be very fond of the soft flesh of this species (6472, 6538, 6539, 6540, 6542, 6547).

## SILURIDÆ. (Catfishes, chik yu)

*Arius falcarius* Richardson.

Three specimens; length, 150 to 160 millimeters. (6587, 6627, 6659.)

## PLOTOSIDÆ. (Naked catfishes)

*Plotosus arab* (Forskål).

Seven specimens. Color brown with 2 longitudinal white bands. Length, 50 to 200 millimeters. (6570, 6591, 6597, 6617, 6619, 6628, 6825.)

## BELONIDÆ. (Gar fishes, fa paw poong)

*Tylosurus caudimaculatus* (Cuvier).

Head, 2.90 to end of caudal vertebra; snout, 4.30; eye slightly less than the interorbital space; dorsal, 14; anal, 17. (6475.)

## EXOCÆTIDÆ. (Flying fishes)

*Cypsilurus simus* (Cuv. and Val.).

Dorsal, 12; anal, 8; ventrals reaching middle of anal base; pectorals uniform dark blue, neither banded nor spotted. (6529, 6534, 6545.)

*Hemiramphus cantoris* Bleeker. (Halfbeak)

Head, 2.3 to end of caudal vertebra; snout beyond end of upper jaw, 2.25 in length; eye slightly less than interorbital space; dorsal, 15; anal, 14; upper lobe of caudal strongly tipped with black, lower lobe yellowish. Length, 195 to 225 millimeters. (6473, 6487, 6514, 6517, 6525, 6537.)

## ATHERINIDÆ. (Silversides)

*Atherina forskålii* Rüppell.

Length, 51 to 60 millimeters. (7687, 7688.)

*Atherina bleekeri* Günther.

Length, 65 millimeters. (6406.)

## MUGILIDÆ. (Mulletts, chal yu)

*Mugil longimanus* Günther.

Scales, 32-12; dorsal, IV, 8; anal, III, 9. A dark spot in axil of pectorals; tip of caudal dusky; tip of soft dorsal dusky; maxillary completely hidden; adipose eyelid well developed; origin of dorsal over the anterior third of anal; pectorals equal to length of head; origin of spinous dorsal midway between end of caudal vertebra and origin of ventrals. (6270, 6273, 6274, 6276, 6278, 6279, 6282, 6283, 6284, 6286.)

*Mugil cephalus* Linn. (Striped mullet.)

*Mugil oeur* FORSKÅL.

*Mugil macrolipidotus* RICHARDSON.

Dorsal, IV, 8; anal, III, 8; scales, 38-40; head, 3.90; depth, 4; eye about equal to snout; a dusky stripe on center of each series of scales on upper half of body; a large dusky blotch on base of pectorals, adipose eyelid present and covering all of eye except pupil. Maxillary hidden except at tip. (6280, 6285.)

*Mugil planiceps* Cuv. and Val.

Greenish brown above, each series of scales with a darker line; pectorals short, equal to length from center of eye to posterior margin of opercles; adipose eyelid narrow, of greatest width posteriorly, scarcely covering half of iris; no spot in axil of pectorals; maxillary showing at tip. (6281.)

## SPHYRÆNIDÆ. (Barracudas)

*Sphyræna obtusata* Cuv. and Val.

Head, 3; depth, 6; eye, 5.5; opercle ending in a single point. Length, 120 to 375 millimeters. (6452, 6492, 6496, 6498, 6507.)

*Sphyræna jello* Cuv. and Val. (Banded barracuda.)

One specimen, length, 175 millimeters. This species is characterized by the 16 dark bands over the back, the very small scales, and the 2 points on the opercle. (6448.)

## POLYNEMIDÆ. (Threadfins)

*Polydactylus tetradactylus* Shaw.

Four pectoral appendages; tip of dorsal black; pectorals usually with a grayish wash. (6341, 6360, 6361, 6362, 6364.)

*Polydactylus plebeius* (Broussonet).

Young with 5 pectoral appendages, some of them of greater length than the pectorals; a black spot above origin of lateral line; tip of dorsals dusky; caudal lobes elongate, grayish at tip. (6368.)

FISTULARIIDÆ. (Cornet fishes)

*Fistularia serrata* Cuv.

Two specimens were secured, length, 320 and 410 millimeters, respectively; a young, probably of this species, has the scutes less developed, and is also characterized by some darker bars over the back. (6494, 6530.)

HOLOCENTRIDÆ. (Soldier fishes)

*Holocentrus ruber* Lacépède.

This beautiful species is very common in Hongkong. Length, 160 to 210 millimeters. (6395, 6396.)

SCOMBRIDÆ. (Mackerels, chi yu)

*Scomberomorus guttatum* (Bloch).

This is one of the best flavored fishes of the Hongkong market. Length, 223 millimeters. (7757.)

CARANGIDÆ. (Cavallas)

*Trachurus trachurus* Linn.

This species is characterized by the plates which extend the entire length of the lateral line; opercular spot, black. Length, 135 to 137 millimeters. (7759, 7765.)

*Scomberoides lysan* (Forskål).

Length, 130 millimeters. (7769.)

*Caranx ophthalmotænia* (Bleeker).

Length, 75 to 120 millimeters. (7760, 7766, 7770, 7771.)

*Caranx malabaricus* (Bloch and Sch.).

Length, 120 millimeters. (7764.)

*Caranx boops* Cuv. and Val.

Length, 80 to 90 millimeters. (7763, 7772.)

*Caranx calla* Cuv. and Val.

Length, 150 millimeters. (7762.)

*Caranx djeddaba* (Forskål).

Length, 200 millimeters. (7761.)

## STROMATEIDÆ. (Butterfishes)

*Stromateus niger* Bloch. (Black pomfret, hak chong.)

The dorsal and anal rays are elongate and extend to a line with base of caudal; the ventrals extend to origin of anal. In specimens 10 centimeters in length, the ventrals and dorsal are considerably shorter and there is but a slight trace of a keel on the caudal peduncle. The very young are marked with indistinct dusky bands, and there is a dusky spot at the base of each lobe of caudal. (5405, 6289, 6291, 6299, 6315, 6317, 6318.)

*Stromateus argenteus* Bloch. (White pomfret, pak chong.)

*Young*.—No ventrals; no spines before dorsal or anal, the lobe of caudal not elongate, color white. (6311, 6312, 6320.)

## EQUULIDÆ. (Slip mouths)

*Equula insidiator* (Bloch).

Length, 90 to 107 millimeters. Ten specimens. (6575, 6586, 6621, 6636, 6638, 6639, 6642, 6657, 6663, 6672.)

*Equula ruconia* (Hamilton-Buchanan).

One specimen, length, 56 millimeters. (6676.)

*Leiognathus edwardsi* Evermann and Seale.

Length, 60 to 170 millimeters. (6558, 6582, 6601, 6631, 6632, 6637, 6658, 6669, 6670.)

*Leiognathus virgatus* Fowler.

Length, 60 to 67 millimeters. (6551, 6584, 6645, 6655, 6673.)

*Leiognathus daura* (Cuvier).

Tip of snout and a portion of nape, dark. Length, 90 to 95 millimeters. (6565, 6599, 6662, 7394.)

## APOGONICHTHYIDÆ. (Cardinal fishes)

*Amia elizabethæ* Jordan and Seale.

Length, 42 millimeters. (6335.)

*Amia bifasciata* (Rüppell). (Yang sun ko.)

*Amia trimaculatus* RICHARDSON.

Yellowish with a dusky vertical strip from the origin of spinous dorsal downward, another from the anterior portion of soft dorsal; a round spot at base of caudal; ventrals dusky; dorsal, caudal, and anal grayish. (6287, 6288, 6295, 6307, 6308.)

***Amia marginatus* Döderlein.**

Color in alcohol yellowish; top of head and nuchal region with fine black specks; top of dorsals black, a black band through middle of soft dorsal; tips of anal and caudal dusky. (6290, 6294, 6302, 6348.)

***Amia döderleini* Jordan and Snyder.**

Color in alcohol yellowish; a blackish stripe from snout through eye to the round distinct caudal spot; a dark line from above eye to near the upper margin of the caudal spot, another from subopercle to just below the caudal spot, another (frequently obliterated) on sides of belly, and another (often obliterated) along the base of the dorsal fins; a black line through bases of anal and soft dorsal; tips of caudal, soft dorsal, and anal grayish. (6266, 6292, 6298.)

***Amia semilineatus* (Schlegel).**

Color in alcohol yellowish white; a jet black caudal spot; a black line from tip of snout through eye to posterior margin of opercle, another from snout over interorbital space to below origin of soft dorsal, and a third on median line of nuchal region; tip of spinous dorsal black. (6304.)

***Amia lineatus* (Schlegel).**

Color in alcohol yellowish white, with a silvery wash on sides; about 11 or 12 vertical dark bars on each side, scarcely as wide as interspaces; tip of spinous dorsal and tip of caudal grayish. (6345, 6353.)

***Amia kiensis* Jordan and Snyder.**

This is undoubtedly the species discovered and figured by Jordan and Snyder, but I suspect that it is *A. frænata* of Valenciennes; it is most certainly the species figured by Day as *A. frænata*. All of our specimens are without the caudal spot, the dark line from tip of snout extends to tip of caudal, the second dusky line is from tip of snout above eye to upper margin of caudal peduncle; the most persistent marking in all ages is the dusky tip to ventrals which is present in all specimens. There is a dark line through base of anal and soft dorsal. (6296, 6297, 6300, 6301, 6310, 6325, 6327, 6328, 6329, 6333, 6334, 6336, 6338, 6339, 6340, 6343, 6351, 6354, 6357, 6359.)



## AMBASSIDÆ. (Wharf fishes)

*Priopis urotænia* (Bleeker).

Color yellowish white; a silver stripe from head to caudal; membrane between 2d and 3d dorsal spines dusky; 2 rows of scales on cheeks. (6323, 6324, 6326, 6330, 6331, 6332, 6337, 6342, 6346, 6347, 6352, 6355, 6356.)

## SERRANIDÆ. (Garoupa, sek pan)

*Cephalopholis boenack* (Bloch).

One specimen, length, 180 millimeters. (7776.)

*Epinephelus moara* (Schlegel).

This species is characterized by the 7 bands of dark brown over the back, the 2 or 3 anterior ones extending forward on to the head. This fish is well figured by Jordan and Seale.<sup>1</sup> Fifteen specimens. (7712, 7722, 7724, 7725, 7780, 7781, 7790.)

*Epinephelus septemfasciatus* Thunb.

Thirteen specimens of this species were secured. Length, 60 to 210 millimeters. This species is characterized by the 8 black vertical bands over the body; there are some enlarged teeth at the angle of the preopercle. (7778, 7779, 7782, 7783, 7791-7799.)

*Epinephelus boenack* (Bloch).

One specimen, this fish resembles somewhat *E. septemfasciatus*, but it has less distinct bands on the sides and the preopercular angle is distinctly rounded, with the teeth scarcely enlarged at angle. Length, 120 millimeters. (1784.)

*Epinephelus merra* Bloch.

This is a food fish of considerable importance in Hongkong. One specimen, length, 176 millimeters. (7715.)

*Epinephelus dermatopterus* (Temm. and Schleg.).

Head, 3; depth, 2.55; eye slightly less than interorbital, 5 in head; snout slightly longer than diameter of eye; maxillary extending to a line with anterior margin of pupil; posterior margin of preopercle almost straight, some enlarged teeth at angle.

Dorsal, XI, 21; anal, III, 10; about 135 rows of scales from head to end of caudal vertebra; caudal rounded, body covered

<sup>1</sup> *Proc. Davenport Acad. Sci.* (1905), 10, Pl. 5.

with minute ctenoid scales; teeth in 2 or more rows; 2 enlarged curved canines anteriorly.

Color uniform brown, fins all darker, being almost black posteriorly; length, 111 to 185 millimeters. (7756, 7757.)

*Epinephelus gilberti* Richardson.

Color yellowish brown, with round darker brown spots the size of pupil, over body. Two specimens, length, 235 to 270 millimeters. (7795, 7797.)

#### LUTIANIDÆ. (Snapper, lap yu)

*Lutianus annularis* (Cuv. and Val.).

*Lutianus erythropterus* DAY.

This species is distinguished by the black stripe from snout to origin of dorsal; the black saddle over the caudal peduncle bordered anteriorly and posteriorly with white; dark lines on body; ventrals tipped with black. Six specimens, length, 75 to 120 millimeters. (7704, 7705, 7706, 7707, 7708, 7709.)

*Lutianus monostigma* (Cuv. and Val.).

One specimen, length, 104 millimeters. (7753.)

*Lutianus erythropterus* Bloch.

This species resembles *L. vitta*, but is without the dark line on sides. Length, 67 to 180 millimeters. (7732, 7748, 7749, 7752, 7754, 7755.)

*Nemipterus japonicus* (Bloch).

Length, 98 to 115 millimeters. (7750, 7751.)

*Diploprion bifasciatum* (Kuhl and Van Hasselt).

This species is characterized by the 2 broad black bands which are very distinct even in alcoholic specimens. Length, 185 to 190 millimeters. (7773, 7774.)

#### THERAPONIDÆ. (Grunts)

*Scolopsis vosmeri* Bleeker.

This species is easily distinguished by the silvery white saddle over the neck and the black spot in upper axil of pectorals. Length, 140 millimeters. (7726.)

*Therapon cuvieri* (Bleeker).

Six specimens, length, 105 to 127 millimeters. The dark stripes terminate at the caudal, the markings below the median line of the side are almost obliterated. (7728, 7730, 7731, 7734, 7736, 7737.)

*Therapon theraps* (Cuv. and Val.).

Four small specimens, length, 95 to 105 millimeters. A common food fish of Hongkong. (7727, 7729, 7733, 7735.)

*Therapon jarbua* (Forskål).

Length, 51 to 72 millimeters. (7679, 7680, 7681, 7682, 7683, 7684, 7685.)

#### HÆMULIDÆ

*Pristapoma hasta* Bloch.

Six young specimens (6562, 6671, 7689, 7690, 7691, 7692) have the bands over the back; length, 65 millimeters. In the large specimen (7697) these bands are broken up into black spots; length, 170 millimeters.

#### SPARIDÆ. (Porgies)

*Lethrinus mahsenoides* Ehrenberg.

All of these specimens show the round black spots below the lateral line above the middle of pectorals. Length, 100 to 120 millimeters. (7693, 7694, 7695, 7696.)

*Sparus datnia* (Hamilton).

A food fish of importance. Length, 100 to 115 millimeters. (7744, 7746, 7747.)

*Sparus berda* Forskål.

Length, 110 to 142 millimeters. (7738, 7739, 7740, 7741, 7742, 7743, 7745.)

#### GERRIDÆ. (Mojarras)

*Xystæma punctatum* (Cuv. and Val.).

Length, 67 to 100 millimeters. (6564, 6572, 6667.)

#### MULLIDÆ. (Surmulletts).

*Upeneus displurus* Playfair.

Color yellowish, with a slight brownish wash above. A yellow stripe from eye to below second dorsal, a second yellow stripe from upper lip through lower border of eye to below second dorsal; these give the appearance of a brown stripe to the area between the two yellow lines; a yellow saddle over free portion of tail, a brown stripe down sides of snout. In old specimens the first dorsal is clouded with brown and the second dorsal and the anal are indistinctly barred with pale brown; in young specimens the fin markings are indistinct. (6444, 6457, 6485, 6506, 6512, 6513.)

**Upeneus bensasi** (Temm. and Schleg.).

No yellow band on sides (in alcohol), the dorsal with dusky bands; teeth of vomer very distinct—those of the palatine in an interrupted band. (6429, 6442.)

**Upeneoides sulphureus** (Cuv. and Val.).

One specimen. (6244.)

**Upeneoides moluccensis** Bleeker.

Head, 3.75; depth, 3.5; eye, 3.75; snout, 2.60; interorbital, 3.50; depth of caudal peduncle, 2.75; scales, 34 to end of caudal vertebra; villiform teeth in jaws, vomer, and palatines; dorsal, VIII, 1, 8; anal, 1, 6. The palatine teeth form a continuous band on each side; the vomerine teeth consist of a minute patch on the head of the vomer, easily overlooked. Length of the spinous dorsal is 1.20 in the depth of the fish. Color in alcohol pale yellowish brown above, yellow below, a bright orange band from eye to caudal; spinous dorsal, soft dorsal, and upper lobe of caudal with about 4 cross bars; tip of spinous dorsal dusky. It is probable that *U. moluccensis* Bleeker will be found to be synonymous with *U. bensasi* Temminck and Schlegel as these specimens partake of the characters ascribed to each of these species, with a predominance of those ascribed to *U. moluccensis*. (6420, 6423, 6425, 6431, 6436, 6441, 6445, 6458, 6460, 6488, 6526.)

**Upeneoides tragula** (Richardson).

This fish is known to the Chinese as *yang tsuan* or *yéung tsun*. It is a common food fish in the Hongkong market. The color is yellowish white with a dusky stripe along the middle of side from eye to caudal. The body is thickly dotted with small brownish spots. The caudal has 4 oblique dusky bars. The dorsal fins are marked with blackish. Length, 20 centimeters. (6440.)

## SCIÆNIDÆ. (Croakers)

**Sciæna diacanthus** (Lacépède).

*Corvina catalea* RICHARDSON.

Dorsal, IX, I, 20; anal, II, 7; scales about 52 in lateral line. Color in alcohol grayish yellow, dark spots on back and sides, pectorals and anal dark, remaining fins spotted, caudal very acute; teeth of upper jaw rather large, teeth of lower jaw large, upper jaw overhanging. Length, 50 to 70 millimeters. (6344, 6358, 6426, 6428, 6491, 6516, 7710.)

*Sciæna aneus* Bloch.

Length, 60 to 125 millimeters. (6349, 6350, 6415, 6456, 6461, 6467, 6481, 6490, 6497, 6520, 6544, 6674.)

*Sciænoides biauritus* Cantor.

Length, 150 to 165 millimeters. (6421, 6476.)

## SILLAGINIDÆ. (Whittings)

*Sillago sihama* (Forskål).

One specimen, length, 165 millimeters. (6480.)

*Sillago maculata* Quoy and Gaimard.

Two specimens, length, 141 to 165 centimeters. (6471, 6532.)

## CEPOLIDÆ. (Bandfishes)

*Acanthocepola krusensternii* (Temm. and Schleg.).

A narrow dark margin on anal and posterior portion of dorsal. Length, 130 to 140 millimeters. (6550, 6583, 6596, 6661, 7387, 7389.)

## CIRRHITIDÆ. (Sea goldfishes)

*Cirrhitities aureus* (Temm. and Schleg.).

When alive these fish were golden in color, but in alcohol 5 or more very indistinct dusky vertical bands are visible on the body. It is probable that *C. oxycephalus* of Bleeker and *C. aureus* Temminck and Schlegel are the same species. These specimens have teeth on vomer and palatine. One specimen has the first dorsal ray prolonged into a filament. (6585, 8654.)

## LABRIDÆ. (Wrasse fishes, wong fa yu)

*Duymæria flagellifera* Cuv. and Val.

*Duymæria aurigaria* GÜNTHER, Cat. Fishes Brit. Mus. (1862), 4, 121.

*Duymæria flagellifera* JORDAN AND SNYDER, Proc. U. S. Nat. Mus. (1902), 24, 623.

This species exhibits a large variety of color patterns, and shows great diversity in the length of the dorsal filaments. All of our specimens show the black tip to opercle. (6563, 6567, 6569, 6600, 6609, 6641, 6651.)

*Thalassoma lunare* (Linn.).

Characterized by the longitudinal purple bar extending on to the 4th to 8th pectoral rays. (6610.)

*Stethojulis kalosoma* Bleeker.

Color dull yellowish, lighter below; a dark, white-margined stripe from slightly below eye to a line with origin of soft dorsal fin; each scale on the lower posterior portion of body with a round brown spot; no spot on caudal or dorsal. (6635.)

*Halichæres dussumieri* (Cuv. and Val.).

*Julis exornatus* RICHARDSON, Rep. Brit. Assoc. Adv. Sci. for 1845 (1846), 258.

*Halichæres nigrescens* BLEEKER.

(6568, 6578, 6584, 6605, 6614, 6647, 6652.)

*Halichæres javanicus* Bleeker.

Color in alcohol yellowish, with 6 irregular purplish bands over the back, these being made up of purplish spots; dorsal with yellowish rings; anal with yellowish rings, almost obliterated in one specimen and entirely faded out in another; head with yellowish violet specks; a blue spot behind orbit and in axil of pectorals. (6580, 6589, 6626.)

*Halichæres pœcilopterus* (Schlegel).

One specimen, length, 170 millimeters. (6648.)

*Chærops ommopterus* Richardson.

Dorsal spines, 12; scales of lateral line, 30; color in alcohol dull greenish, almost all the scales on the side showing a short vertical blue mark; on the caudal peduncle the blue marks are longitudinal instead of vertical, these form about 5 blue stripes on each side of the caudal peduncle; a blue stripe from angle of mouth to margin of opercle; a blue circle on base of pectoral; a darker line from eye along sides of snout to upper jaw; some blue lines on upper opercle; a jet-black spot below the base of the last dorsal spines. No yellowish area behind this spot as in *C. schœnlieni* Bleeker. Anal fin with blue lines and spots; ventrals yellowish, with slight markings of blue; none of the fins elongate. Length, 22 centimeters. (6571.)

SCARICHTHYIDÆ. (Parrot fishes, kai kung yu)

*Callyodon limbatus* (Richardson).

(6555, 6556, 6557, 6558, 6559.)

*Callyodon dubius* Bennett.

*Pseudoscarus æuginosa* GÜNTHER.

Color in alcohol pale greenish brown, 3 white stripes on sides of belly; lips wide, 3 rows of scales on cheeks, the lowest row of 2 scales. (6603, 6611.)

## EPHIPPIDÆ. (Indian spade fishes, ying kung)

*Ephippus orbis* (Bloch).

Color yellowish with round blackish spots, usually larger than eye. The young have a dark ocular band, with the addition of a second dusky band on the shoulders. (6303, 6306, 6316, 6322.)

## DREPANIDÆ. (Spade fishes)

*Drepane punctata* (Gmelin). (Ke lung tsang.)

*Drepane punctata* GÜNTHER, Cat. Fishes Brit. Mus. (1860), 2, 62;  
RICHARDSON, Rep. Brit. Assoc. Adv. Sci. for 1845 (1846), 244.

One specimen. (6277.)

## CHÆTODONTIDÆ. (Butterfly fishes)

*Chætodon aureus* Temm. and Schleg.

Ocular band about equal in width to eye and with a broad yellowish white area in front and back of eye; ventrals yellow; the brownish lines on the rows of scales are almost longitudinal, except on shoulders where they are decidedly oblique; the caudal has a terminal margin of white and a narrow black line at a short distance from the margin. To this species belong *C. collaris* Jordan and Fowler<sup>2</sup> and *C. aureus* Günther both of which are from Japan. Evidently Richardson suspected that *C. aureus* Temminck and Schlegel and *C. collaris* Bloch might be the same, for he says that, "they agree tolerably well," which makes it certain they did not agree fully; therefore, he was not warranted in uniting them.

*Chætodon reticulatus* Cuvier and Valenciennes is quite distinct from both *C. aureus* Temminck and Schlegel and *C. collaris* Bloch, and is characterized by the broad black ocular band, which in most of its length is of much greater width than the eye; the lower portion of the ocular band extends backward to the origin of the ventrals and covers a large part of the thorax; the ventrals are yellow; the caudal has a very narrow margin of white with 2 black intermarginal lines separated by a yellow band; the base of caudal is jet black. *Chætodon prætextatus* Cantor seems to be a valid species most nearly related to *C. collaris* of Bloch, being characterized by the dusky ventrals, wide ocular band, and black tip to the opercles; Günther, who has specimens of both *C. prætextatus* and *C. collaris*, regards them as being different.

<sup>2</sup> *Proc. U. S. Nat. Mus.* (1902), 25, 534.

**Chætodon collaris Bloch.**

*Chætodon collaris* DAY, Fishes of India, Atlas (1878), Pl. 27, fig. 6; BLEEKER, Atlas Ichth. (1877), 9, Pl. 23, fig. 2; GÜNTHER, Cat. Fishes Brit. Mus. (1860), 2, 21; JORDAN and EVERMANN, Proc. U. S. Nat. Mus. (1903), 25, 356.

This species, which is without doubt *C. collaris* of Day, of Bleeker, and of Günther, is characterized by the dark ventrals, comparative narrow ocular band which does not extend to the origin of the ventrals, and the color of caudal which is broadly margined with white with a broad black bar near its center. *Chætodon collaris* Günther<sup>3</sup> is possibly a variety of *C. reticulatus* Cuvier and Valenciennes with the black ocular band extending backward on the thorax to the origin of the ventrals; it certainly has but slight resemblance to Bloch's type of *C. collaris*. The species described by Jordan and Evermann<sup>4</sup> is probably distinct and should be described as such.

**Chætodon modestus Temm. and Schleg.**

*Chætodon desmotes* JORDAN AND FOWLER, Proc. U. S. Nat. Mus. (1902), 25, 539.

This species is related to *C. rafflesii* Bennett which is, however, probably a valid species. (6293.)

**Chætodon bella-maris Seale, sp. nov. Plate I, fig. 1.**

Head, 3.10 in length without caudal; depth, 1.45; eye, 3.15 in head; snout slightly greater than diameter of eye; interorbital space slightly greater than snout; dorsal, XII, 23; anal, III, 21; lateral line strongly curved, ending at axil of soft dorsal, pores 46; scales in 34 series between head and end of caudal vertebra, 23 in a vertical series; head covered with fine scales; mouth small; teeth setiform; gill rakers low and pointed, about 17 on lower arch; spinous dorsal fitting into a scaled sheath at base, the 4th, 5th, and 6th spines the longest; soft dorsal rounded, no rays prolonged, length of longest ray but slightly less than head; caudal 1.35 in head, its margin almost straight; anal similar to soft dorsal; ventrals equal to length of head without opercular flap; a large axillary scale; pectorals equal to head with opercular flap.

Color in life yellowish, a black ocular band which is slightly greater than width of eye above the eye and slightly less than width of eye below; this band is continuous above, and extends to margin of subopercular below the eye; the band is margined

<sup>3</sup> Günther, Fische der Südsee (1873-75), Heft II, Taf. 31 A.

<sup>4</sup> Jordan and Evermann, Proc. U. S. Nat. Mus. (1903), 25, 356.



anteriorly and posteriorly with white; snout yellow; the tip of upper jaw black; a large black wedge-shaped mark on shoulder from spinous dorsal to the white border of the ocular band; this black area has a narrow prong of black extending from its posterior margin to upper tip of opercle; a narrow black margin to dorsal; a wide submarginal black band on posterior half of caudal; tip of caudal white; 12 to 14 rather wide, indistinct, brownish lines extending obliquely forward and downward on rows of scales; anal yellowish, with a marginal brown band; ventrals and pectorals yellowish.

This species is related to *C. lunula* Lacépède (*C. fasciatus* Bleeker), but differs in lacking the second black area on the shoulders and the semilunar band of black on soft dorsal, our specimen being without any black on the caudal peduncle, which according to Günther is present in *C. lunula* at all ages.

Type is No. 6321, Bureau of Science collection, collected in the Hongkong market by Seale, 1910.

*Microcanthus strigatus* (Cuv. and Val.).

*Microcanthus strigatus* CUV. AND VAL., Hist. Poiss. (1831), 7, 25, Pl. 120; GÜNTHER, Cat. Fishes Brit. Mus. (1880), 11, 34; JORDAN AND FOWLER, Proc. U. S. Nat. Mus. (1902), 25, 541.

Color in alcohol yellowish with about 5 or 6 longitudinal, slightly inclined, brown stripes, about the width of the eye. Spinous dorsal blackish, stripes on body projected into anal fin, ventrals with dusky tip; pectorals and caudal yellowish. (6313.)

#### SIGANIDÆ. (Siganids)

*Siganus oramin* (Bloch and Schn.).

Scattered white spots over body, caudal indistinctly barred, upper margin of eye serrated; a distinct shoulder spot. Length, from 80 to 205 millimeters. (6417, 6442, 6446, 6451, 6482, 6483, 6518, 6574, 6604, 6606, 6613, 6618, 6620, 6622, 7392.)

#### MONACANTHIDÆ. (File fishes, hih pe yang)

*Monacanthus chinensis* (Bloch).

*Monacanthus chinensis* GÜNTHER, Cat. Fishes Brit. Mus. (1870), 8, 236; RICHARDSON, Rep. Brit. Assoc. Adv. Sci. for 1845 (1846), 201. (6566, 6634.)

*Monacanthus setifer* Bennett.

*Monacanthus setifer* GÜNTHER, Cat. Fishes Brit. Mus. (1870), 8, 239; SCHLEGEL, Fauna Japonica (1842), 290, Pl. 130, fig. 1 (good).

Dorsal, 32; anal, 32. The second dorsal ray produced. Color in alcohol brown with obscure blackish spots or streaks.

**Monacanthus lineolatus** Richardson.

Color in alcohol dirty light brown with from 6 to 8 fine dark lines on the body from head to near caudal. A dark spot below anterior half of soft dorsal, a dark blotch on opercles, margin of ventral membrane black, caudal with 2 dusky bands. This species is well described by Richardson.<sup>5</sup> (6629.)

## TETRAODONTIDÆ. (Puffers)

**Spheroides spadiceus** (Richardson).

This fish is believed to be poisonous. (6366, 6367, 6370, 6373, 6374, 6375, 6376, 6377, 6378, 6380, 6381, 6382, 6384, 6385.)

ELEOTRIDÆ.<sup>6</sup> (Eleotrids)**Bostrychus sinensis** (Lacépède).

This species is very common in Hongkong. It is distinguished by the black ocellus on the upper base of the caudal rays. Length, 110 to 150 millimeters. (6414, 6424, 6427, 6450, 6465.)

**Butis butis** (Hamilton-Buchanan).

Length, 117 millimeters. (6433.)

**Butis caperata** Cantor.

Distinguished from *B. butis* by the shorter head, shorter snout, and larger eye. Length, 65 millimeters. (6495.)

## GOBIIDÆ. (Gobies)

**Boleophthalmus chinensis** (Osbeck).

*Gobius pectinirostris* GMELIN.

*Boleophthalmus boddaerti* SCHLEGEL.

Length, 90 to 110 millimeters. (6410, 6413, 6454, 6466, 6468, 6469.)

**Boleophthalmus glaucus** Day.

Length, 67 millimeters. (6531.)

**Rhinogobius hongkongensis** Seale, sp. nov. Plate I, fig. 2.

Head, 4; depth, 5.60 without caudal; eye, 3.1 in head; snout equal to eye; interorbital space a narrow ridge; dorsal, VI, 12; anal, 11; scales 25 to end of vertebra,  $8\frac{1}{2}$  in a vertical series;

<sup>5</sup> Rep. Brit. Assoc. Adv. Sci. for 1845 (1846), 201.

<sup>6</sup> It seems advisable to advance the subfamily of Eleotrinæ to the position of a family characterized by the separate ventrals, and thus in part separating the cumbersome family Gobiidæ.

no scales on cheeks or opercles, nape fully scaled to posterior margin of eyes, 10 series anterior of spinous dorsal; snout rounded, jaws equal; maxillary extending to anterior margin of eye, teeth of lower jaw small, sharp pointed, in several rows—the outer row being enlarged curved teeth resembling canines; an extra large recurved canine on each side, upper jaw with a single series of strong sharp teeth; tongue truncated or but slightly rounded; gill openings wide, but not extending forward; body fully scaled, the scales on posterior half of body somewhat larger; no free silk-like rays at the origin of pectorals.

Spinous dorsal with the 2d, 3d, and 4th rays longest; soft dorsal and anal similar in form and of about equal height, their posterior rays being about 1.50 in head. The origin of soft dorsal is on a line with anal pore; origin of anal below the 2d dorsal ray; ventrals firmly united for entire length, the basal cup deep, length of the fin equal to distance from nostril to posterior margin of opercle; pectoral slightly greater than length of head; caudal rounded, 1.20 in head.

Color in alcohol pale wood brown with a series of about 14 small, more or less complete, circles of darker brown (sepia) along the median line of sides, margin of scales on upper half of body also slightly shaded with sepia, 1 or 2 narrow lighter longitudinal lines above the row of median circles; a black line from posterior margin of eye to upper base of pectoral fin, 4 or 5 blue spots on opercles and irregular brown blotch on cheeks below eye; 2 brownish blotches on base of pectoral; dorsals marked with about 4 longitudinal brownish lines; tip of spinous dorsal dusky; anal shading into slaty gray on outer third; caudal marked with whitish spots; pectorals and ventrals pale yellowish brown, the ventral with a slight grayish wash.

Three specimens from Hongkong market, August 9, 1910. Type is No. 6474, Bureau of Science collection; length, 70 centimeters; cotypes are Nos. 6489 and 6541.

*Gobius pœcililichthys* Jordan and Snyder.

Dorsal, VI, 10; scales about 35, upper pectoral rays silk-like; tongue truncate. Length, 57 to 60 millimeters. (6408, 6523.)

*Glossogobius giuris* (Hamilton-Buchanan).

Length, 74 to 78 millimeters. (6409, 6463, 6477, 6504.)

*Oxyurichthys cristatus* (Day).

Length, 85 millimeters. (6484.)

***Oxyurichthys amabilis* Seale, sp. nov. Plate II, fig. 1.**

Head, 4 without caudal; depth, 6; eye, 4 in head; dorsal, VI, 13; anal, 14; scales, 50; enlarged scales on posterior half of body; 21 scales in vertical series; snout 3.30 in head; interorbital space a mere ridge; mouth large, the lower jaw slightly the longer; maxillary extending to below middle of eye; upper jaw with a single series of rather strong sharp teeth, lower jaw with a single row of similar but smaller teeth; tongue rounded; head naked except on the occiput which is finely scaled; no tentacles; about 24 scales in front of dorsal; anterior anal spine longest, 1.25 in head; soft dorsal and anal similar, origin of anal under 1st ray of soft dorsal; caudal long and acuminate, 2.60 in length of fish without caudal; ventrals scarcely equal to length of head, their origin is anterior to the origin of dorsal, their tip scarcely reaching to anal pore; length of pectorals, 3.5 in body without caudal; no silk-like rays.

Color a very light brown, white on chin and thorax, fins with a slight grayish wash, anal blackish.

Type is No. 6432, Bureau of Science collection, secured in Hongkong market by Seale; length, 130 millimeters; 3 cotypes, Nos. 6411, 6438, and 6453.

***Gobiichthys tentacularis* (Cuv. and Val.).**

Length, 75 to 110 millimeters. 6500, 6501, 6505, 6510, 6515, 6519, 6523, 6524.)

***Cryptocentrus filifer* (Cuv. and Val.).**

Length, 105 to 130 millimeters. (6412, 6430, 6447, 6449, 6470, 6478.)

***Cryptocentrus venustus* Seale, sp. nov. Plate II, fig. 2.**

Head, 3.75; depth, 5.50; dorsal, VII, 10; anal, 11; scales on anterior portion of body very small, becoming larger posteriorly, about 90 in lateral series from posterior border of opercle to end of caudal vertebra, about 27 in a vertical series; mouth large, the maxillary ending slightly posterior to eye; teeth in several series, some slightly enlarged ones in the outer row of upper jaw and in the inner row of lower jaw, no recurved canines; no posterior canines; tongue truncate; gill rakers rather blunt, 14 on lower arch; head naked, without filaments or barbules; eye rather small, 4.5 in head, and about equal to length of snout; interorbital space very narrow, being equal to pupil; anterior dorsal rather high, its longest spine being equal to length of head, the 6th spine is located a considerable space from the 5th; origin of soft dorsal midway between end of caudal

vertebra and posterior margin of eye, the soft dorsal is similar to anal; caudal rather pointed, its length 3.25 in fish without caudal; origin of anal below 3d ray of soft dorsal; ventrals united and long, almost equal to caudal, the tip extending to anal pore, the cup at the base very deep; origin of ventral midway between tip of snout and origin of anal; pectoral slightly less than length of head, its base rather muscular.

Color in alcohol, a wide dark-brownish saddle over back at the spinous dorsal which extends downward on sides of belly; there is a similarly colored area above the anal fin along the middle of sides, remaining area lighter brown; a brownish area on head back of eyes and on cheeks, about 15 small scattered blue spots on cheeks; spinous dorsal, ventral, and anal dark purplish; soft dorsal dark with several lighter longitudinal lines, caudal and pectorals uniform brown.

One specimen, type No. 6419, Bureau of Science collection, from Hongkong; length, 103 centimeters. Collected by Seale and Canonizado.

*Trypauchen vagina* Bloch and Schn.

Color yellowish white. Length, 60 to 75 millimeters. (6493, 6527, 6543.)

*Tridentiger bifasciatus* Stindachner.

Outer row of teeth trifold, the middle cusp the longest, 2 black bands on sides, the one on middle of sides very wide and distinct, the other at base of dorsal much less distinct. Length, 40 to 55 millimeters. (6486, 6502, 6535, 6536, 6549.)

*Apocryptes bato* (Hamilton-Buchanan).

Dorsal, V-1, 13; anal, 14; length, 110 to 140 millimeters. (6418, 6439.)

#### SCORPÆNIDÆ. (Scorpion fishes)

*Sebastopsis marmorata* (Cuv. and Val.).

The dark bands over the back and spots on caudal, dorsal, and anal fins distinguish this species. Length, 100 to 130 millimeters. (7723, 7758.)

#### PLATYCEPHALIDÆ. (Flatheads)

*Platycephalus insidiator* (Forskål).

This fish is very common in the Hongkong markets. It is easily distinguished by the black and yellow stripe of the caudal fin. Length, 30 centimeters. (6593.)

**Thysanophrys neglectus** (Troch.).

This species is characterized by the spinate lateral line, the dusky spinous dorsal, and the dusky bars over back. (6559, 6623, 6630, 6664, 6675.)

**Thysanophrys bataviensis** (Bleeker).

Lateral line, 57; dorsal, caudal, pectorals, and ventrals with rows of black dots. (6656.)

**CEPHALACANTHIDÆ.** (Flying gurnards)**Cephalacanthus orientalis** Cuv. and Val.

One young specimen, length, 65 centimeters. (6499.)

**PLEURONECTIDÆ.** (Plaice, pan us)**Pseudorhombus misakius** Jordan and Starks.

*Pseudorhombus misakius* JORDAN AND STARKS, Proc. U. S. Nat. Mus. (1904), 31, 173.

Color light brown, mottled with darker brown; a black spot at branching of lateral line; dorsal, 80; anal, 63. (6579, 6581.)

**Pseudorhombus russellii** (Gray).

Yellowish, clouded with brown, some darker spots on back. Scales, 92; anal, 58; dorsal, 78. (6588.)

**Pseudorhombus olegolepis** Bleeker.

Two young specimens, scales 48. (6560, 6607.)

**Tephritis sinensis** (Lacépède).

Body with fine black spots, some of which are ocellated; fins, except pectorals and ventrals, marked with black. (6633.)

**SOLEIDÆ.** (Soles, yat sa yu)**Cynoglossus melanopterus** Richardson.

Two lateral lines on left side, scales 60, fins dusky. (6577.)

**Cynoglossus abbreviatus** Gray.

Three lateral lines on left side, fins gray, lighter at tip, 120 scales in lateral line. (6646.)

**Synaptura orientalis** Bloch and Schneider.

*Soles faleacea* RICHARDSON.

*Synaptura pan* BLEEKER.

Brown with darker blotches and narrow black bands crossing the lateral line; posterior half of pectorals black. (6624.)

**Solea ovata** Richardson.

This seems to agree in all essential respects with Richardson's description. (6561.)

## PTEROPSARIDÆ. (Pterosparids)

*Parapercis pulchella* (Temm. and Schleg.).

The figure of this species given by Temminck and Schlegel is excellent. It is a common species in Hongkong. Length, 160 millimeters. (6363-6371.)

*Parapercis cylindrica* (Bloch).

Body with narrow dark bands below and 5 wide bifurcated bands above; white and dark spots on throat and chin; a brown band from eye to throat, a dark spot at base of pectorals and on upper base of caudal; spinous dorsal black; soft dorsal and anal with yellowish spots; ventrals yellow. Length, 93 centimeters (6649); length, 82 centimeters (8503).

*Percis sexfasciatus* Temm. and Schleg.

Five bifurcated dusky bands over the back; a brown ocellus on the upper base of caudal; some dark dots at base of dorsal. Length, 85 millimeters. (6660.)

## CALLIONYMIDÆ. (Dragonels)

*Callionymus curvicornis* Cuv. and Val.

I very much doubt if this species is synonymous with *C. valenciennesi* Schlegel, as in our specimen, as well as in the specimens Günther had from China, the preopercular spine is nearly as long as the orbit and is curved upward; it terminates in 4 hook-like processes, one of which is directed backward; a 5th process at the base of the spine points forward. The posterior of spinous dorsal, which is fin shaped, has a large black spot surrounded by white. The anal fin is white with dusky blotches near its tip. (6612.)

*Callionymus hindsii* Richardson.

This fish is characterized by the alternating vertical lines of jet black and pure white of the spinous dorsal, the black lines being somewhat crooked and of greater width in some places than in others. The preopercular spine ends in 4 recurved claws, with a fifth at the base of the spine directed forward. The anterior dorsal has 3 rays, the posterior has 10. In alcohol the fish is indistinctly speckled with very pale brown on the back, the caudal fin is indistinctly barred with brown and white; some indistinct light specks in soft dorsal, otherwise fins colorless, except the spinous dorsal. Length, 8.5 centimeters. (6650.)





## ILLUSTRATIONS

(Drawings by T. Espinosa)

### PLATE I

- FIG. 1. *Chætodon bella-maris* Seale, sp. nov.  
2. *Rhinogobius hongkongensis* Seale, sp. nov.

### PLATE II

- FIG. 1. *Oxyurichthus amabilis* Seale, sp. nov.  
2. *Cryptocentrus venustus* Seale, sp. nov.



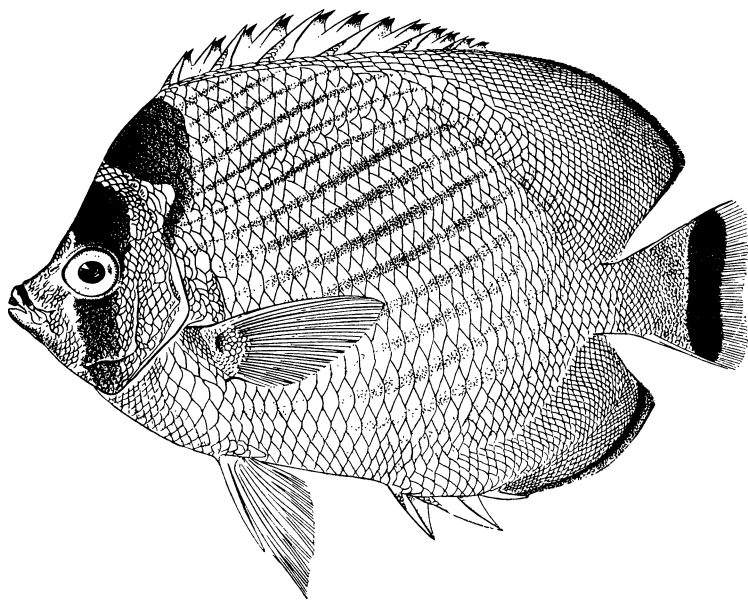


Fig. 1. *Chaetodon bella-maris* Seale, sp. nov.

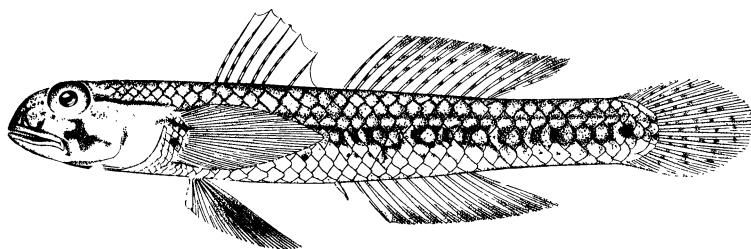


Fig. 2. *Rhinogobius hongkongensis* Seale, sp. nov.

PLATE I.



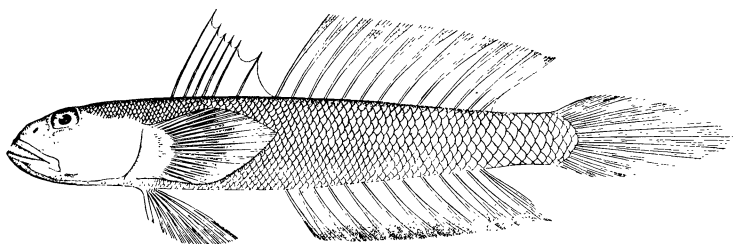


Fig. 1. *Oxyurichthys amabilis* Seale, sp. nov.

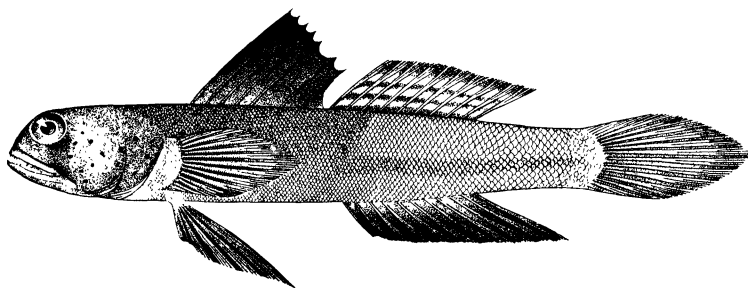


Fig. 2. *Cryptocentrus venustus* Seale, sp. nov.

PLATE II.



BUPRESTIDES RECUEILLIS AUX ÎLES PHILIPPINES PAR

C. F. BAKER, I<sup>1</sup>

Par CH. KERREMANS

(Brussels, Belgium)

Une figure dans le texte

*Acmacodera luzonica* Nonfr., Berl. Ent. Zeitschr. (1895), 40, 302.

LUZON, Los Baños.

*Epidelus wallacei* Thoms., Arch. Ent. (1857), 1, 109.

LUZON, Mt. Maquiling.

*Chrysodema eximia* Cast. et Gory, Monogr. Bupr. (1835), 1, 8, Pl. 2, fig. 9.

LUZON, Los Baños.

*Chrysodema adjuncta* Saund., Trans. Ent. Soc. London (1874), 310.

LUZON, Mt. Maquiling.

*Dicercomorpha argenteoguttata* Thoms., Typ. Bupr., App. (1879), 13.

LUZON, Los Baños.

*Philanthaxia lata* sp. nov.

Long. 8; larg. 3 mm. Oblong ovale, élargi au tiers postérieur, entièrement bronzé obscur, un peu mat, avec les angles postérieurs du pronotum d'un bronze plus clair, légèrement pourprés; dessous plus noir, pattes bronzées, tarses et antennes noirs, le 1<sup>er</sup> et le 2<sup>e</sup> article de celles-ci bronzés.

Tête plane; front vaguement déprimé; la surface couverte de points fins, confluent. Pronotum en trapèze, faiblement bisinué en avant et tronqué en arrière, les côtés obliques et à peine arqués, la surface couverte d'une ponctuation fine, très égale, semblable à celle de la tête, mais présentant sur le disque de fines rides sinueuses. Ecusson triangulaire, presque deux fois aussi large que long. Elytres légèrement élargis au tiers postérieur, finement dentelés sur les côtes de là jusqu'au sommet; celui-ci étroitement tronqué; la surface couverte de stries linéaires, plus rapprochées sur les côtés que sur le disque, les interstries aplanis, subrugueux, très également et densément ponctués. Dessous moins rugueux que le dessus, la ponctuation de l'abdomen aci-

<sup>1</sup> Proof read by C. F. Baker.

culée, et simulant de très fines écailles, couvert d'une pulvéulence blanche.

LUZON, Mt. Maquiling.

*Chrysobothris bistrispunctata* H. Deyr., Ann. Soc. Ent. Belg. (1864), 8, 111.

LUZON, Los Baños.

*Belionota fallaciosa* H. Deyr., Ann. Soc. Ent. Belg. (1864), 8, 84.

LUZON, Mt. Maquiling.

*Melibæus bakeri* sp. nov.

Long. 4; larg. 1 mm. Petit, étroit, assez convexe, atténué en avant et en arrière, entièrement bronzé obscur et brillant, la partie antérieure du front verte.

Tête étroite, convexe avec une légère dépression longitudinale au dessus de l'épistome. Pronotum grand, convexe, faiblement bisinué en avant et en arrière; les côtés déprimés, la dépression prolongée le long de la base, la marge latérale arquée, anguleusement rentrante en arrière tout près de la base; la surface assez rugueuse, couverte de petites rides sinueuses et transversales. Ecusson petit, triangulaire. Elytres impressionnés de part et d'autre à la base avec le calus huméral saillant; les côtés sinués à hauteur des hanches postérieures, atténués en arc depuis le milieu, celui-ci séparément arrondi et inerme; la surface couverte de rugosités simulant de très fines écailles entre des rides sinueuses. Dessous moins rugueux que le dessus, mentonnière du prosternum bilobée.

LUZON, Los Baños.

*Melibæus æneifrons* H. Deyr., Ann. Soc. Ent. Belg. (1864), 8, 134.

LUZON, Mt. Maquiling; Los Baños.

*Sambus auricolor* Saund., Trans. Ent. Soc. London (1874), 322.

LUZON, Los Baños.

*Sambus lugubris* Saund., Trans. Ent. Soc. London (1874), 323.

LUZON, Mt. Maquiling; Los Baños.

*Cryptodactylus philippinensis* Saund., Trans. Ent. Soc. London (1874), 321.

LUZON, Los Baños.

*Agrilus luzonicus* sp. nov.

Long. 6.5-7; larg. 1.7 mm. Voisin de l'*A. acutus* Thunb., mais différent de celui-ci par une série de caractères constants. Toujours plus petit et moins ventru, l'impression médiane de la base



du pronotum moins profonde et moins large, l'épine terminale des élytres toujours moins longue et plus grêle, moins élargie à la base et montrant, sur le côté externe, une fine dentelure bien marquée, tandis qu'elle est moins nette et moins aiguë chez l'*acutus*, la coloration constante, d'un bronze verdâtre clair, rarement bleuâtre; enfin, l'aspect général plus lisse et plus brillant.

LUZON, Los Baños.

*Agrilus nigrocinctus* Saund., Trans. Ent. Soc. London (1874), 325.

LUZON, Los Baños.

*Agrilus discicollis* H. Deyr., Ann. Soc. Ent. Belg. (1864), 8, 189.

LUZON, Los Baños.

*Agrilus vilis* Saund., Trans. Ent. Soc. London (1874), 327.

LUZON, Los Baños.

*Agrilus bakeri* sp. nov.

Long. 8-8.5; larg. 2 mm. Allongé, légèrement élargi au tiers postérieur, atténué en arrière, tête, côtés du pronotum et extrémité des élytres cuivreux pourpré ainsi que le dessous, le pronotum et les élytres bleu verdâtre, ceux-ci ornés de part et d'autre de deux taches pubescentes et blanches, l'une au milieu, l'autre vers le tiers postérieur; le dessous couvert d'une pulvéulence blanche.

Tête forte, de la largeur du pronotum, sillonnée sur toute sa longueur, et couverte de rides sinueuses bien marquées. Pronotum un peu plus large que long et aussi large en avant qu'en arrière, faiblement bisinué en avant, plus fortement en arrière, les côtés parallèles, à peine arqués, sans carène postérieure distincte, la carène latérale oblique et à peine sinueuse, rapprochée de l'inférieure; une vague impression linéaire et arquée longe tout le milieu; la surface couverte de rides sinueuses. Ecusson cuivreux, large, transversalement caréné. Elytres peu convexes, impressionnés à la base, plans sur le disque, déclives sur les côtés, légèrement élargis au tiers postérieur, dentelés et séparément arrondis au sommet, la surface couverte de très fines rugosités régulières et simulant de petites écailles. Dessous plus finement rugueux que le dessus; mentonnière du prosternum forte, échancrée au milieu; pattes médiocres.

LUZON, Los Baños.

*Agrilus monticola* sp. nov.

Long. 7; larg. 1.8 mm. Moins allongé et plus robuste, plus convexe en dessus que le précédent, le sillon transversal du pro-

notum beaucoup plus large, plus profond et situé plus en arrière vers la base, le sommet des élytres plus largement arrondi, subtronqué et plus fortement dentelé, la région suturale déprimée, entièrement bleu indigo foncé, verdâtre sur les élytres, avec, de chaque côté de ceux-ci, deux monchetures pubescentes et blanches superposées, l'une après le quart postérieur, l'autre à l'apex.

Tête assez forte, un peu plus étroite que la base du pronotum, le vertex convexe et profondément sillonné, la surface ponctuée, moins fortement ridée que chez le précédent; antennes courtes et épaisses. Pronotum plus large que long, un peu plus étroit en avant qu'en arrière, bisinué en avant et en arrière, le lobe médian de l'avant très arqué; les côtés obliques et à peine arqués, la carène postérieure ne rejoignant pas la marginale, celle-ci oblique et sinueuse, l'inférieure parallèle à celle-ci en avant et sinueuse; le disque transversalement impressionné en avant et largement sillonné en arrière du milieu, le sillon remontant sur les côtés au dessus de la carène postérieure; la surface couverte de très fines rayures sinueuses et transversales. Ecusson triangulaire, plus large que haut et caréné transversalement. Elytres déprimés de part et d'autre à la base, sinués sur les côtés, ensuite élargis au tiers postérieur où ils laissent à découvert une étroite portion de la région dorsale des segments abdominaux, atténués obliquement jusqu'au sommet, celui-ci assez largement tronqué et assez fortement dentelé; région suturale très légèrement déclive; suture saillante en arrière; la surface assez rugueuse et couverte de rugosités simulant des écailles. Dessous moins rugueux que le dessus, couvert d'une pubescence très courte, régulièrement espacée sur l'abdomen; mentonnière du prosternum large, subsinueuse et tronquée en avant; pattes peu robustes.

LUZON, Mt. Maquiling.

*Agrilus fontanus* sp. nov.

Long. 5; larg. 1 mm. Allongé, subparallèle sur les côtés, entièrement noir en dessus, la moitié interne des élytres couverte d'une courte pubescence grisâtre peu visible, le dessous d'un noir plombé, entièrement couvert d'une courte pubescence grise.

Tête forte, aussi large que la base du pronotum, convexe, faiblement sillonnée sur le vertex, couverte de très fines rides transversales et sinueuses. Pronotum presque carré, plus large que long, aussi large en avant qu'en arrière, la marge antérieure plus fortement bisinuée que la postérieure, avec un large lobe médian avancé; les côtés subparallèles, à peine arqués; carène postérieure grande, arquée, rejoignant la marginale en avant

du milieu; carène laterale subsinueuse, visible en dessus, l'inférieure assez éloignée d'elle en avant; le milieu du disque avec une très vague fossette en avant et une autre plus nette, au dessus de l'écusson; la surface couverte de rides sinueuses et transversales bien marquées. Ecusson petit, plus large que long, caréné transversalement. Elytres couvrant entièrement l'abdomen, transversalement déprimés à la base, légèrement le long de la suture, celle-ci élevée et lisse sur presque toute sa longueur, sauf à la base; le sommet séparément arrondi et à peine dentelé; la surface également couverte de rugosités simulant de très fines écailles. Dessous plus clair et un peu plus luisant que le dessus; mentonnière du prosternum grande, largement lobée; pattes assez robustes.

LUZON, Los Baños.

*Agrilus balnearis* sp. nov.

Long. 4.5; larg. 0.7 mm. Ecourté, assez convexe, atténué en arrière, entièrement bleu brillant, avec, sur les élytres, une large bande bleu d'acier foncé et glabre, tandis que le reste des élytres et du dessous sont couverts d'une très courte pubescence gris blanchâtre, plus dense sur la région postérieure des élytres, après la bande noire.

Tête forte, avec les yeux épais et très saillants en dehors, sillonnée longitudinalement au milieu, et entièrement couverte de rides sinueuses. Pronotum bisinué en avant, aussi large en avant qu'en arrière, sa plus grande largeur au milieu, les côtés arqués; carène postérieure grande, sinueuse et rejoignant la marginale en avant du milieu; carène marginale plus sinueuse que l'inférieure; le milieu du disque à peine déprimé transversalement au dessus de l'écusson; la surface couverte de rides sinueuses et transversales identiques à celles de la tête. Ecusson mat, transversalement caréné. Elytres légèrement élargis au tiers postérieur, impressionnés à la base, tronqués et tridentés de part et d'autre au sommet; la suture finement corborée du tiers postérieur à l'apex; la surface couverte de rugosités simulant de très fines écailles. Dessous plus lisse et plus brillant que le dessus; mentonnière du prosternum assez grande et lobée; pattes peu robustes.

LUZON, Los Baños.

*Agrilus atomus* sp. nov.

Long. 3.5; larg. 0.7 mm. Subparallèle, un peu plus large en avant qu'en arrière, entièrement bronzé verdâtre, le front vert

et mat, les élytres et le dessous couverts d'une courte pubescence grise, rare.

Tête étroite en avant et large en arrière, le front aplani, le vertex bombé et sillonné. Pronotum un peu plus long que large et un peu plus large en avant qu'en arrière, la marge antérieure bisinuée avec un large lobe médian avancé et arqué; les côtés légèrement courbes et convergents vers la base; celle-ci faiblement bisinuée, carène postérieure sinueuse et allongée, rejoignant la marginale en avant du milieu; celle-ci oblique, presque droite, en entièrement visible en dessus, l'inférieure arquée; le milieu du disque sillonné, le sillon élargi en arrière; la surface couverte de rides sinueuses et transversales. Ecusson petit, caréné. Elytres largement et peu profondément déprimés à la base, couverts de rugosités simulant de petites écailles, séparément arrondis et inégalement dentelés au sommet. Dessous plus foncé et plus luisant que le dessus; mentonnière du prosternum grande et arquée; pattes peu robustes.

LUZON, Los Baños.

*Aphanisticus bodongi* sp. nov.

Long. 3.5; larg. 0.7 mm. Appartient au groupe des *Aphanisticus* allongés et cylindriques de l'Europe. Entièrement noir, très légèrement bronzé, brillant. Tête forte, finement pointillée, sillonnée profondément sur toute sa longueur. Pronotum un peu plus large que long, à peine plus étroit en arrière, lisse et brillant comme la tête et très finement ponctué; la marge antérieure bisinuée; les côtés faiblement arqués et un peu convergents en arrière; le disque convexe, limité en avant par un sillon longement la marge et en arrière par un autre sillon plus large; une carène postérieure nette, étroite et perpendiculaire à la base, la marge latérale très oblique. Ecusson très petit, triangulaire. Elytres très rugueux, couverts de rides transversales, légèrement déprimés le long de la suture, largement et séparément arrondis au sommet. Dessous beaucoup moins rugueux que les élytres; marge antérieure du prosternum tronquée, sans mentonnière.

LUZON, Los Baños.

Cette espèce se retrouve dans l'Inde, à Simla.

*Endelus bakeri* sp. nov.

Du groupe des *E. weyersi* Rits. et *modiglianii* Kerrem. voisin, pour la tête et le prolongement des tubes oculaires, de l'*E. diabolicus* Kerrem., mais différent de celui-ci par les impressions élytrales et par la coloration générale.

Écourté, pentagonal, entièrement bronzé plus ou moins clair en dessus; dessous presque noir.

Tête large, profondément creusée; yeux très saillants en dehors, émergeant de tubes écourtés; la surface presque lisse et très brillante. Pronotum beaucoup plus large que long, écourté, tronqué en avant avec les angles antérieurs aigus et avancés; les côtés largement arqués en avant et sinués en arrière avec les angles postérieurs obtus; le milieu du disque avec deux larges carènes transversales. Ecusson petit, triangulaire. Elytres écourtés, saillants à l'épaule, sinueux sur les côtés, atténués obliquement en arrière, largement et séparément arrondis au sommet et très finement dentelés; la surface gondolée et inégale, avec de larges impressions latérales et discales, arrondies sauf celles-ci longeant la suture, de chaque côté du sommet et qui sont allongées. Dessous plus lisse et plus luisant que les élytres.

Long. 3.5-4; larg. 1.25-1.5 mm.

LUZON, Los Baños.

*Trachys dubia* Saund., Trans. Ent. Soc. London (1879), 328.

LUZON, Los Baños.

*Trachys cornuta* sp. nov.

Long. 3; larg. 1.6 mm. Remarquable par la forme toute particulière des antennes dont le premier article, très développé, à la forme d'une mandibule arquée en dedans et cintrée en dehors, comme le montre la figure ci contre de l'antenne du côté droit, alors que les autres articles sont presque moniliformes. Le seul spécimen que j'aie sous les yeux est un mâle; il se peut donc qu'il s'agisse d'un caractère sexuel, mais il est si tranché qu'à première vue il semble que l'antenne soit implantée sur une mandibule dirigée vers l'extérieur.

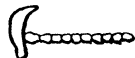


FIG. 1. L'antenne de *Trachys cornuta*.

Triangulaire, acuminé en ligne presque droite en arrière, tête et pronotum bronzé presque noir, les côtés du second garnis d'une pubescence pulvérulente de blanc, les élytres bronzé clair avec une large postmédiane noire, avec, en arrière de cette bande, de chaque côté, une bande pubescente blanche en forme de V; dessous noir.

Tête largement creusée avec le bord interne des yeux tranchant. Pronotum trois fois aussi large que long, échancré en avant et fortement bisinué en arrière, avec les côtés déprimés, largement et obliquement arqués, confluent en avant. Ecusson petit, triangulaire. Elytres graduellement et régulièrement atténués sur les côtés depuis la base jusqu'au sommet, avec, de chaque

côté, une fine côte naissant du calus huméral et longeant la marge latérale à une certaine distance de celle-ci; la surface finement granuleuse, plus lisse sur la bande noire. Dessous luisant, plus lisse que les élytres.

LUZON, Los Baños.

*Trachys bakeri* sp. nov.

Long. 3; larg. 1.6 mm. Ressemble, pour le facies général, au *T. subbicornis* Motsch., du Japon; entièrement différent de celui-ci pour la coloration et pour le dessin élytral.

Ovoïde, peu convexe, la tête et le pronotum bronzés, la première, plus claire que le second, couverts d'une pubescence couchée, rare et courte; élytres noirs couverts d'un dessin linéaire pubescent de blanc formé par des cercles sur la moitié antérieure et par deux lignes superposées et en zic-zac sur la postérieure. Dessous noir.

Tête brillante, largement et peu profondément creusée en triangle en avant, le bord des yeux non tranchant. Pronotum à bords non aplanis, largement et peu profondément échancré en avant; les côtés obliquement arqués et convergents vers l'avant; la base fortement bisinuée, la surface couverte de points très fins et aciculés. Ecusson réduit à un point à peine visible. Elytres régulièrement atténués en arc depuis l'épaule jusqu'au sommet, celui-ci conjointement arrondi; le calus huméral peu saillant; la base déprimée contre le calus; la surface finement granuleuse; vus de profils, les élytres forment une ligne sinuante légèrement bombée vers le sommet et déclive ensuite. Dessous moins rugueux que le dessus.

LUZON, Los Baños.

*Trachys formosana* Kerrem., Arch. f. Naturgesch. (1912), 209.

LUZON, Los Baños.

Le type provient de l'île Formose.

## ILLUSTRATION

Figure dans le texte

FIG. 1. L'antenne de *Trachys cornuta*.





NOTES ON THE MALAY PANGOLIN, *MANIS JAVANICA*  
DESMAREST<sup>1</sup>

By W. SCHULTZE

(From the Entomological Section, Biological Laboratory, Bureau of  
Science, Manila, P. I.)

Two plates

During a recent trip to Palawan I had the opportunity to observe a specimen of the pangolin, *Manis javanica* Desmarest, in captivity for a period of about three weeks. The animal was captured by a native boy who discovered it in the act of climbing a tree. Previous to the capture of the animal, I had given some attention to the collecting of specimens of termites or white ants. The species that builds the roughly globose nests on the trunks or branches of trees was fairly common about Taytay, and I had observed that many of the nests had been destroyed or partly destroyed. Generally, the disturbed nests had a round or irregularly shaped hole in one side and all or part of the contents of the interior had been removed. Some of the disturbed nests still remained attached to the trunks or branches of trees, while others had been broken off. I was at first inclined to attribute the destruction of the nests to some species of bird, and thought it possible that the bird was feeding on the termites or that it utilized the hollowed nests as breeding places.

Upon receiving the pangolin, I offered it various species of large true ants, but it paid no attention to them and refused to eat. I then secured a fresh brood comb from a terrestrial termite nest with its included termites, and the pangolin quickly consumed all the insects. To supply the animal in this way with sufficient food presented considerable difficulties, and remembering the destroyed and partly destroyed nests of the arboreal termites that I had observed in the forests the idea occurred to me that the pangolin was probably responsible for their destruction and that these particular termites, to a large degree, sup-

<sup>1</sup> Desmarest, *Mammalogie* (1822), 2, 377; Blandford, *Fauna Brit. India*, *Mammalia* (1891) 599, fig. 199; Hollister, *This Journal*, *Sec. D* (1912), 7, 35.

plied the food of the animal. I accordingly secured several of these arboreal termite nests, and placed them in the cage with the animal. The pangolin commenced to break open a nest shortly after dark. Its method of accomplishing this is very peculiar. First, it is necessary to give some idea of the characters of the nest in order better to understand how well the animal is adapted to its food supply.

The termite nests are usually subglobose, sometimes being rather irregular in shape, and from 20 centimeters to 50 centimeters in diameter. In color they are usually dark brown or black, and externally have a rather flaky appearance. The outermost part of the nest is rather thin, and is brittle in texture. The entire interior of the nest is made up of a somewhat porous material that is more or less sponge-like in appearance, but not at all sponge-like in texture, being very hard and somewhat brittle. In the region where the queen chamber is located, the surrounding material is still harder, and the passages or cells are slightly smaller than in the external portions.

In opening the nest the pangolin at first removes the outer layer from one side by means of its powerful claws. The animal then commences working its way into the interior of the nest by inserting its claws into the passages or cells and using them as levers, thus breaking away, in small pieces, the very hard material that makes up the interior of the nest. While doing this work, the animal may assume any position—standing on its hind legs or lying down on its side, on its belly, or even on its back on the top or on the sides of the nest—depending on the location of the nest. As soon as it has worked a short distance into the interior, it reaches the regions inhabited by the termites, and, while busily engaged with its claws in breaking down the interior of the nest, it keeps its tongue constantly protruded, licking up the termites that are disturbed or dislodged, in its efforts to reach the interior of the nest. In this manner, the pangolin hollows out the nest sometimes to such a degree that only a thin crust or shell about 3 centimeters in thickness is left. If the nest be very large, it is generally more or less broken up; small nests are rarely broken, but retain their original shape after being hollowed out completely (Plate I). The pangolin under observation consumed the contents of as many as four medium-sized nests in one night. Very probably during the dry season, the Palawan pangolin lives mostly on these arboreal termites. In Palawan, the terrestrial termite nests or mounds are mostly found in rather open brush or grass lands and are so hard that the animal could not burrow into them during the dry season.

It probably uses them as food supply during the rainy season. The pangolin seems to have poor eyesight, at least during the daytime. However, its sense of smell is apparently very acute. Its sense of direction is undoubtedly largely dependent on scent. The animal under observation was repeatedly liberated, and soon after being removed from its cage it raised its head and sniffed in various directions. It then invariably turned toward the nearest forest or thicket and walked away in that direction. When it had decided upon a given course, no amount of turning could deflect it, and after being turned about it always resumed its original direction. Even lifting the animal by its tail and quickly revolving it failed to confuse it. It never turned toward open places or toward the sea. There is little doubt that it depends largely upon its sense of smell in locating termite nests, especially those that are placed high in the trees. If disturbed when walking about, it quickly puts its head between its front legs, turns a somersault, and rolls up into a ball (Plate II, fig. 2), making a hissing noise when so doing. Its powerful tail (Plate II, fig. 3), which has a horny pad on the end, is a great aid to the animal in climbing and in hanging on branches of trees. The animal has a very peculiar odor.



## ILLUSTRATIONS

### PLATE I

(Photographs by Charles Martin)

- FIG. 1. Arboreal termite nest hollowed out by *Manis javanica* Desmarest, showing opening.  
2. Opposite side of the termite nest shown in fig. 1.

### PLATE II

(Photographs by courtesy of Dean C. Worcester)

- FIG. 1. *Manis javanica* Desmarest in walking position.  
2. *Manis javanica* rolled up.  
3. *Manis javanica* climbing.

*Vol. VIII, Sec. D, No. 6 of this Journal was issued May 25, 1914.*





Fig. 1. Showing opening.



Fig. 2. Opposite side of the nest shown in fig. 1.





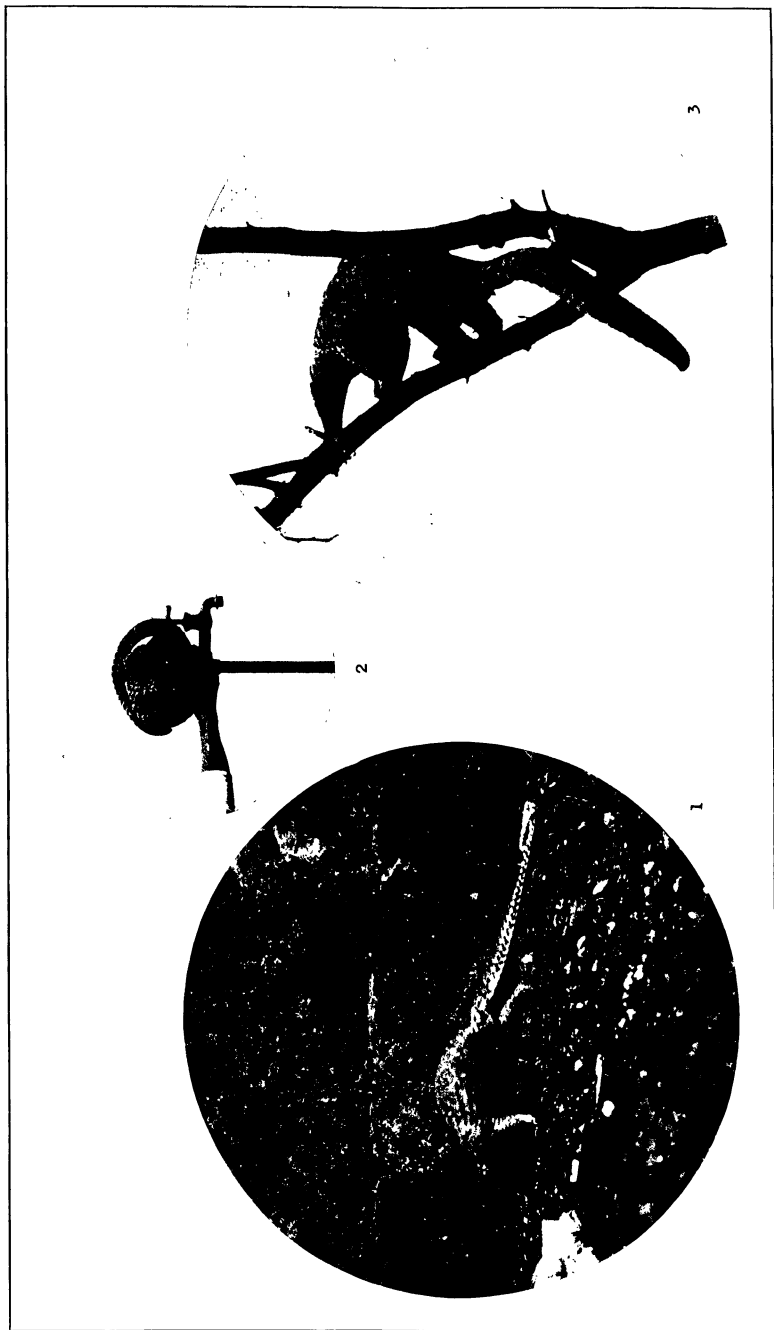


Fig. 1. In walking position. 2. Rolled up. 3. Climbing.  
PLATE II. MANIS JAVANICA DESMAREST.







# THE PHILIPPINE JOURNAL OF SCIENCE

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## NOTES ON IRRIGATION AND COÖPERATIVE IRRIGATION SOCIETIES IN ILOCOS NORTE <sup>1</sup>

By EMERSON B. CHRISTIE

(*From the Museum, Bureau of Science, Manila, P. I.*)

One plate

Reports of the Bureau of Public Works state that the Province of Ilocos Norte has some 15,000 hectares under a fairly satisfactory degree of irrigation. Besides this land, there is a considerable area irrigated only during the season of transplanting and growing rice; that is to say, the wet season.

Irrigation works of some sort are to be found in all the municipalities in the province. Bangui and Nagpartian, the two northernmost towns in the province, have together some 1,500 hectares of rice land under irrigation. About nine-tenths of this land is under irrigation only during the wet season, owing to the imperfection of the irrigation works. Neither town has dams of a permanent nature. Diversions are made usually by temporary dams of bamboo and rock from 0.5 meter to 3 meters high. These are crudely constructed, and are either completely destroyed each year or require considerable repairing. Some of the 27 ditches in these towns have no headgate nor wasteway provisions, and as a consequence their channels have been cut so deep as to leave portions of the lands they once watered above water. The most ambitious irrigation work to be seen in this part of the province is the heading of an old canal which was destroyed about a generation ago. It had a

<sup>1</sup>I am indebted to the courtesy of the Bureau of Public Works for the data on the extent of irrigation in Ilocos Norte which appear in this article.

solid masonry gate, and the heading is cut for some distance through a rock cliff. There are 10 canals in Bangui-Nagpartian, each 1 kilometer or more in length. The two longest are about 3 kilometers long.

The people of Pasuquin, south of Nagpartian, have exploited the available water supply to a considerable extent. In the northern part of the territory of this municipality, 4 small rivers are made to irrigate about 1,000 hectares of rice land during the wet season, and in the southern part of the town about half as much land is watered from a lateral of the Paratong canal, which draws water from the Bacarra or Bubuisan River. An attempt is made to water these 500 hectares the year around, but complaints made by the landowners indicate that the supply of water is unreliable owing to certain imperfections in the canal.

Laoag, the capital of the province, is badly off with regard to irrigation. Certain works which formerly utilized the water of one or two minor creeks for wet-season irrigation have been destroyed in course of time, and according to the latest data available only about 600 hectares of land in the municipality are under irrigation. Of this land, about 100 hectares are irrigated only during the wet season. The rest is watered by a branch of the Kamungao canal, which draws water from the Bacarra River. The people of Laoag who use this canal complain of a shortage of supply during dry weather. This shortage, in the opinion of an engineer of the Bureau of Public Works, is due not to a failure of the supply in the river, but to defects of an engineering order.

Laoag is situated on the largest river in the province. There is a gauge record of a quarter of a million second liters for this stream, and it is probable that this amount of water is exceeded at times. The want of irrigation work on this river is sufficiently accounted for by the size and the difficulty of the problem of utilization. The problem is further complicated by the circumstance that the river bears a heavy raft-traffic in rice which is floated from towns on the upper reaches to Laoag, and any obstructions to this traffic would cause an uproar from those interested in it.

San Miguel has 9 ditches which irrigate some 500 hectares during the wet season.

Piddig is better supplied with irrigation than any town in the province except the three dependent on the Bacarra River. Nearly 2,000 hectares of land in the municipality are under irrigation, more than half of it all the year around. The water

is drawn from the Gisit River, a tributary of the Laoag. The most important canal is provided with a masonry headgate and wasteway, and shows good maintenance. This canal irrigates some 800 hectares.

Dingras has a good deal of land under irrigation, but lacks proper provisions for the control and distribution of water.

Batac has canals and other irrigation works. The Kiawit River runs in an artificial channel which is said to have been made for it as far back as 1760, under the direction of the Filipino after whom it is named. In course of time, however, the bed of this stream has become badly eroded, resulting in an inconvenient lowering of the water below the fields which it was intended to irrigate. The water, both of this and other irrigation works, is far from sufficient for the needs of the land under present arrangements. It is worth noting that many ditches in this municipality are provided with masonry diversion weirs and headgates, with proper provision for varying the openings.

Paoay has several old ditches in poor condition which are inadequately supplied with water.

Badoc, the southernmost town of the province, has nearly 4,000 hectares of irrigated land. On the high land which cannot be reached by canals, extensive masonry walls have been constructed to catch the flood water and distribute it over areas devoted to raising rice. Most of the ditches are small, and belong to individual landowners.

The Badoc River runs through the municipality. Water is diverted from this stream by low temporary dams of bamboo and rock, which may last one or several seasons. The ditches are well constructed, and show good maintenance. Masonry headgates, checks, and other necessary structures have been provided on most of the systems, and largely eliminate the bad waste noticeable in other municipalities of the province. The longest ditch is about 2 kilometers in length. Most of the land irrigated is watered only during the wet or rice-growing season.

Irrigation works in the municipalities of Bacarra and Bintar, watered from the Bacarra or Bubuisan River, deserve special mention, for they exemplify the fullest development of irrigation practice to be found in the province. They cover some 7,000 hectares of land, most of which is supplied with water all the year, and thus is enabled to raise two or three crops a year.

Practically all the water used for irrigation in these towns

is drawn from the Bacarra or Bubuisan River. This stream rises in the northeastern part of the municipality of Bintar, and runs its entire course to the China Sea through this municipality and that of Bacarra. From its source to the latter town, the stream is made up of a series of rapids, a circumstance which makes it easy to divert water for irrigation purposes. The stream carries a fair amount of water even in the dry season. According to a gauging made in April, 1909—that is, during a dry month—below the town of Bacarra and below all points where water was diverted there was a discharge of 3,300 second liters going to waste.

There are 8 canals which divert water from the Bacarra River, covering from 200 to 1,800 hectares each, and some 35 small ditches, watering from 2 to 70 hectares each. All of these ditches, it is said by the people of the towns, have been built by the landowners and are maintained by them. The larger ditches have been well constructed, and show fairly good maintenance. Diversions are made by temporary dams of bamboo and rock, which are either destroyed or require considerable repairing each year. Rows of stakes are driven into the bed of the stream, and the spaces between are filled with stones and brush. Permanent headgates and wasteways above the high-water mark have been provided on a number of the larger ditches, reducing repair work on the ditches. Important structures employed on the canals such as checks, drops, and culverts are of a permanent nature, and are usually constructed of cobblestones laid in lime mortar.

It would be beyond the scope of this article, which aims only to convey a general idea of the degree of development of native irrigation in Ilocos Norte, to give a detailed description of all the irrigation works in Bacarra and Bintar. In order to illustrate the utmost that has been done in this region, I shall give a few facts regarding the two most ambitious works, the Paratong and the Kamungao canals.

The former is the largest and most important canal in the province. Heading just above the town of Bacarra, it extends across this municipality and waters about 500 hectares in the municipality of Pasuquin, besides nearly 850 hectares in Bacarra. The main canal and the Bacarra and Pasuquin laterals are about 20 kilometers long. It is claimed, and I know of no evidence to the contrary, that this canal was built by the landowners without the assistance of any regular engineer. Many repairs are necessary each year, and these are made by the landowners benefited by the system. At one place, where the Pasuquin



lateral heads, the water of the canal is carried across the Bangsirit estero in flumes. The Paratong canal has a capacity of 3,000 second liters.

The Kamungao canal is about 6 kilometers long, and serves over 800 hectares. It heads opposite the town of Bacarra, and crosses the divide between the valley in which that town is situated and Laoag, about 500 hectares of the land it serves being situated in the latter municipality. The system is well constructed, and is provided with masonry headgates and wasteway. But conditions at the heading are such as to give rise to some complaints from landowners on the Laoag side of the shortage of water. The heading of the canal is at a bend in the river; there is no diversion dam, and the channel is so high that an inadequate supply of water is diverted.

The Bisaya ditch which irrigates certain lands in Bintar is of interest as showing what the natives are capable of doing, because for the greater part of its course of 3 kilometers down the cañon of the Bacarra River the waterway is formed by a masonry wall at the foot of the rock cliffs.

All the irrigation done in this province depends on gravity. No pumps, water wheels, or other mechanical devices are in use.

It is of interest to know how the foregoing works and others similar to them have been built and are maintained. No very large landed estates are found in this province.<sup>2</sup> Even the few landholdings of comparatively large extent are almost invariably divided into several parcels separated from each other. Hence, it is but seldom that any one man finds it to his interest to build irrigation works of any considerable size for the use of his land. Therefore, the necessary feed canals and other works for bringing water from the rivers to the land must be built by coöperation if they are to be built at all. This state of things has given rise to a large number of irrigation societies. These are of interest to a student of the Ilocano people for two reasons; namely, their importance to the agriculture of the region and their indication of the capacity of the people for coöperative effort.

These societies of the Ilocano people are a marked characteristic of the Province of Ilocos Norte. In the Ilocano Provinces of Ilocos Sur and La Union, not very much irrigation from rivers and springs is practiced. Of the irrigation situation among

<sup>2</sup> According to the Philippine census of 1903, the average size of farms and other parcels of land under cultivation in Ilocos Norte is only 0.622 hectare. This is one of the lowest averages to be found in the Philippine provinces.

the Ilocano element of the population of Pangasinan, Zambales, and Nueva Ecija, I am ignorant. In Cagayan Province, certain Ilocano towns—for example, Claveria and Sanchez Mira—have irrigation works of considerable extent. Claveria is said to have more than 2,000 hectares of rice land under irrigation. I suspect that these works have been built and maintained in the same way as those in Ilocos Norte; that is, by popular coöperative societies. But the total extent of irrigation works built and maintained by Ilocanos in this province does not reach that of the works existing in Ilocos Norte. In the latter province, I have enjoyed good opportunities of observing the working of a number of irrigation societies, and some details about them may be of interest.

There are irrigation societies in all the municipalities of this province, but owing to the local conditions these societies play the most important rôle in the northern half of the province and are of special importance in Pasuquin, Bacarra, Bintar, and Piddig.

The members of each society are bound together by a written agreement which prescribes the organization of the body and the field of its operations, defines the duties of its members, and provides penalties for disobedience which range from a small fine to expulsion from the society and confiscation of a member's share in the land irrigated. I have read a number of these agreements as enforced in Bangi, Bintar, and Badoc. There seems to be no standard or pattern for these documents, for they differ widely one from the other. They range in precision and formality from agreements drawn up by lawyers and composed of scores of paragraphs down to a simple statement that "the undersigned agree to undertake the irrigation of such-and-such a piece of land under the leadership of So-and-so." The majority of agreements occupy a middle ground between elaborate precision and sketchy simplicity. They have been drawn up in most cases by men who have local influence, but no legal training. Some of them at least were drawn up with a view to taking up and irrigating a piece of public land; it is not easy otherwise to understand the provision for confiscation of the holding of a member who does not fulfill his obligations. This provision occurs in the following instrument organizing an irrigation society in an outlying settlement of Bintar. The agreement is given here because it is fairly typical of many.

We, who sign our names or make a cross below, agree to make a canal to bring water to the place called Gimamaga. There is no one compelling or

coercing us; we are expressing our spontaneous desires, and we say the following:

First.—We all equally agree to choose a chief<sup>3</sup> to give us orders, to the end that there may be order in our work on the said canal.

Second.—We also agree to choose foremen and designate them as assistants to the said superintendent of construction.

Third.—We agree further that on being given an order by the said chiefs we will not make objections, but will all equally obey the order, and he who disobeys this provision of our agreement shall be given two lashes to punish him for his disobedience, and if he is guilty a second time we will confiscate his share of the property to punish him for his disobedience.

Fourth.—We agree further that when a day fixed upon for our work arrives and our superintendent sounds his horn to call us, we will hasten to present ourselves and will not wait for a third or fourth blowing of the horn, and that that one of us who shall be the last to arrive shall be fined six *cuartos*<sup>4</sup> as a punishment for his lateness, unless he has a reason.

Fifth.—We agree further that when the work on the said canal is begun no one of us may go away or hide; and he who shall be caught hiding shall be given five lashes to punish him for his disobedience, and his explanations shall not be listened to.

Sixth.—We agree further that after the month of July arrives it shall not be permitted to furnish a woman or a child as a substitute, especially if our work consist in building dams, and he who contravenes this agreement of ours shall be liable to a fine of an eighth of a peso, and his explanations shall not be listened to.

Seventh.—As soon as our shares of work shall be allotted, whether the work consist in canal digging or fencing, we will make haste to perform the work, without waiting for the assistance of the whole society; and he who disregards this provision of our agreement shall be fined an eighth of a peso for his disobedience.

Eighth.—We agree also that the obligation of furnishing labor or materials, whether for excavation or for fencing, shall be equally distributed among us.

Ninth.—We agree further that the cost of fenced ways for the passage of animals, such as, horses, buffaloes, oxen, and pigs, shall be equally distributed, and no one shall fail to conform to this rule.

Tenth.—We agree further that we shall be free to invite outsiders to work with us for half a day or a day,<sup>5</sup> but the superintendent shall not have authority to make contracts without first submitting the matter to us at a meeting.

<sup>3</sup> Literally, a man to serve as our father.

<sup>4</sup> About 4 centavos in Philippine currency or 2 cents in United States currency.

<sup>5</sup> In Ilocos Norte it is not unusual for country people to assist a neighbor or relative for a short time without money payment, but on the understanding that they are to be given food and drink. If the work lasts only about half a day, a few drinks of *basi* are considered sufficient compensation; if the work lasts longer, it is incumbent on the man who has invited the workers to regale them with unusually good food, including a meat or fish element, as well as drink. It is in this way that houses are often built and ditches dug without the expenditure of any cash.

Eleventh.—Those who work against our agreement to exploit lands in common shall receive five lashes from us for the first offense, and shall be deprived of their rights for the second, as a punishment for their evil custom, and we will not listen to their explanations.

Twelfth.—We shall have no right to disobey the orders of our superintendent, when he assigns us work, whether the work consist of digging or fencing, and he who acts contrary to this agreement shall be punished as is set down in article seven for his first offense, and for the second he shall be deprived of his share of land as a punishment for his disobedience.

Thirteenth.—It shall not be allowable to call us unexpectedly to a place distant from these fields. If it is desired to call us to a distant place, we must not be called unexpectedly but must be advised in advance.

Fourteenth.—We shall all leave our implements (*i. e.*, in the places where work is being done), whether plow or harnessing rope or harrow, and none but the owners shall take the said implements, and he whom we may catch in the act of taking articles belonging to another person shall, for the first offense, be condemned by us to suffer a suitable penalty, and for the second offense he shall have his share in these fields confiscated as punishment for his disobedience, and no explanations shall be listened to.

All the above clauses of our most true agreement and convention for cultivating the soil in common shall be strictly obeyed; no one is coercing us nor causing us to be coerced, but of our own free will we make this agreement in order to have discipline in our work, and in testimony of our adhesion to this, our agreement and convention, those of us who know how to write sign their names, and those who do not know how to write make their mark and have their names written for them, now in the year eighteen hundred ninety-four.

Dimamaga, *sitio* of Bintar, September 15, 1894.

[Twenty crosses (marks) and three signatures follow.]

There is a supplementary paragraph, dated March 24, 1911, in which it is agreed to choose a new superintendent and to substitute certain names for others.

In this case, the *cabecilla*, or chief, is also the *maestro*, or superintendent of construction. But it is not at all uncommon to find the office of chief of the organization and that of the superintendent of construction divided. Most societies also have a special officer known as the *papelista*,<sup>6</sup> because he keeps the papers; that is, the accounts. His duties are those of a secretary-treasurer. It is his duty, besides keeping the society's funds, to keep account of the fines incurred by the members. Small societies—I have seen the membership list of one which comprised only about half a dozen names—may do without any officers except a chief (*cabecilla*). On the other hand, a large society may have in addition to all the above officers two or three members who may be called a commissariat. These men, instead of working on the canals and structures of the irrigation scheme,

<sup>6</sup> A Spanish word meaning one who has to do with papers.

fish and cook for their fellow members while the latter are at their labor.

Nominally the officers are elected, and may be deposed by vote at any time. In other words, they are subject to the recall. But as a rule, a society has one or more members whose influence is preponderating because of property, shrewdness, education, or past or present government office, who constitute the real controlling force. It must be borne in mind that a very large proportion of the members cannot even read or write. This fact is sufficiently evidenced by the long rows of marks seen at the end of the agreements. The ignorance and humble station in life of the mass of the members make it easy for a local boss who gets to be the chief of an irrigation society to keep control of its activities.

In the case of those societies whose constitutions I have read, the land irrigated is divided into equal shares among the majority of the members, with the stipulation, in the case of many of the larger societies, of larger shares for one or more of the officers. The chief is often thus favored, sometimes to the extent of having twice as much allotted to him as the ordinary members; the superintendent of construction and the secretary-treasurer are also given an advantage sometimes; the foremen have no advantage except that they do not do as much manual labor as the ordinary members.

Landowners who do not belong to a given society frequently want the association to bring water to their land, or wish to enjoy water rights in some canal that passes their land, but which they have not helped to build. In such cases, it is often possible for them to secure the advantages desired by agreeing to give the members of the society a part of the crop. The payment demanded is usually high, amounting often to two-fifths of the crop.

The danger of the chief of an irrigation society enriching himself at the expense of the labor of the members is realized by the Ilocanos, and the article found in the agreement quoted above, forbidding the chief to enter into irrigation contracts without first submitting the proposition to a meeting of the society, is a very common one in instruments of this kind.

Another common provision is one expressly forbidding a member to alienate his share of land without the consent of the society. It is often provided that in case a member wishes to sell he must give the first choice to a fellow-member. On the death of a member, his rights and obligations in a society descend to his heirs.

A provision sometimes seen in the constitutions of irrigation societies in Ilocos Norte is that disputes arising from the work or the shares must be submitted for adjustment to a meeting of the society, recourse to the courts being punished by expulsion.

Money for the purchase of building material, such as timber or lime, is raised by a levy on all the members, or the material may be furnished by members in lieu of work.

An omission which strikes one forcibly in reading the agreements is the lack of any definite provision for dividing the water supplies. This omission corresponds to one seen in the irrigation works; namely, the almost, though not quite, universal lack of any system by which a definite amount of water can be drawn from the main canals to the small ditches of the individual fields. It seems to be assumed that there will be water enough for all. If there is any system to insure rotation and equality of supply, I am not aware of it. Doubtless, the question of a square deal in this matter comes up and is acted upon in meetings of the society.

These meetings take place in some societies at regular intervals. In others, they are called from time to time by the chief.

As may be supposed, something is required to hold slack members of the society to their work. For this reason, in most agreements a definite fine is levied for each day's absence from work when a call has been issued by the head of the society. This fine is expressed in the agreements in terms of money, but in fact is collected in kind at harvest time. It is the principal duty of the secretary-treasurer to keep a record of the number of day's absence of each man and to collect the corresponding amount of fines. These go into the common fund, which is mainly expended for food and drink for the members.

There is a good deal of difference between societies in the degree of strictness with which the payment of fines is enforced. Some societies are evidently very slack in this regard; in others, there is a businesslike strictness.

I have heard of one or two cases of embezzlement on the part of the treasurers, but the circumstances of the collection of fines, namely, that it takes place under the eyes of so many members of the society and that the fines are collected not in money but in the form of bundles of rice, easily noted in amount and rather difficult to get rid of secretly, serve as deterrents to breach of trust.

Besides the ordinary irrigation societies composed of land-

owners, I know of at least one society in Ilocos Norte organized to do irrigation work for hire. The society comprises about thirty men, who are said to own little or no land themselves, but who hire themselves out to proprietors in return for a share of the crop. I have been informed that this society conducts the irrigation work for land that produces about 5,625 hectoliters of unhusked rice. The collection is effected at harvest time by the secretary-treasurer of the society. These men have a recognized chief (*cabecilla*) at the head of their affairs. I do not know what advantage in compensation, if any, is enjoyed by the officers of this society.

It must not be supposed that the members of this society make their entire livelihood by doing irrigation work. That work, as conducted in Ilocos Norte, lasts only a few months of the year, sometimes only a few weeks. During the rest of the year the members are free to work at anything they can. In irrigation work, as in other matters, it is unusual in Ilocos Norte to see specialization.

All the irrigation societies with which I am acquainted hold an annual feast at which they enjoy all the rice, meat, and fermented sugar-cane juice that they can hold. The means to do this come from the fines levied on sluggards; often they are eked out by the results of the chase. From twenty to forty men with nets and dogs can usually get a deer or two or a wild pig in Ilocos Norte, and a few men are commonly told off beforehand to catch fish. The drink—*basi*—can be easily obtained in exchange for rice. In case means are still lacking, the chief levies a contribution of a few centavos on each member.

Most irrigation societies are placed under the patronage of some particular saint, such as San Isidro Labrador (Saint Isidore, the Ploughman or Farmer). But as the most opportune time for holding the feast is at the conclusion of harvest, it is not necessarily held on the day assigned to the patron saint in the calendar.

A feast is preceded by religious ceremonies. Money is paid to a priest by the society to celebrate mass on the preceding Sunday. If all or most of the members are adherents of the Aglipayan organization (the Independent Filipino Church), the money goes to the local representative of that body. I have known of cases where the members have been divided in their allegiance and money has been paid for a mass to the local Roman Catholic priest and also to the local head of the Aglipayan society. The mass, I was always informed, is applicable to

the souls of the deceased members of the society and all those persons from whom the members of the society may have inherited their land.

But besides this and other Christian ceremonies, it is the rule among the societies with which I am acquainted to perform other rites which are not due to the teaching of the Christian Church. One of these is performed at the annual feast just mentioned. It consists of setting forth food and drink for spirits, having in mind not only the ancestors of the members, but spirits in general. I have been present several times at the annual feast of irrigation societies, and once had the good fortune to arrive at the scene early enough to see the offering set out for the spirits and to hear the invitation extended to them. The offering in this case consisted of plates of rice, of two kinds, one of which was the sticky sort called *diket*. There were also dishes of rice cooked with coconut milk (not coconut water) and a little basi. These articles were set out on the floor of a room in the evening and left untouched until early morning. After everything was placed in order, a woman went to each window of the room and invited the spirits in turn in the words which I found to be, in Ilocos Norte, the commonest formula of invitation to them, couched in such general terms as to include not merely ancestors, but any other spirits that might wish to come. These were the words:

Come now, come now, sirs, come, come all, all, let the lame have themselves carried, let the blind be led.<sup>1</sup>

After this, the room was left empty till morning, when the feast began.

This offering of food and drink to spirits at the annual feast is in line with the practice of irrigation societies at other times. An important ditch or canal is seldom opened without certain preliminary ceremonies of a propitiatory nature. Those related below show the practice in the northern two-thirds of the province of Ilocos Norte, where I saw more land being irrigated from streams than in any other part of the Ilocano provinces. Minor details may differ in various towns, but on the whole I found an unexpected degree of uniformity.

When a society has been formed for the purpose of digging a canal and bringing a piece of land under irrigation, a cross about a meter high is planted where the canal is to be opened. Some basi is sprinkled on the ground. Now ensues a wait,

<sup>1</sup> *Umaikayon Appo, umaikayon, umaikai amin amin, dagiti pilai obbaenyo, dagiti bulsek kibinenyo.*



which may extend from only one night to several days, to see whether or not any unfavorable omen appears to any of the members of the society, or a *sangkabagi* or other spirit appears to warn against the proposed undertaking. If an unfavorable omen or vision occurs, the place where it is proposed to start the canal is abandoned; unless the spirit, if there is one in the place, can be appeased by an offering. If a spirit warns against beginning the work, an attempt is made to learn what sort of propitiation it wants. In case a sacrifice is requested, a chicken, for example, the society must learn whether the animal is to be set free at the spot or is to be killed and cooked. In a society with numerous members there is usually at least one who is supposed to know more about spirits, omens, etc. than the other members, and his observations and advice are acted on. Various unfavorable omens are watched for, perhaps the commonest being the falling down or removal of the cross. If nothing occurs during the wait to contraindicate the digging of the ditch, the work is begun, offerings being first put on the platform or altar. These offerings ordinarily consist of rice cooked with coconut, chicken, betel-nut for chewing, tobacco, and basi. When the canal has been made, another ceremony is commonly performed, especially if some difficulty is met with in getting the water to run in the ditch. This rite consists in killing an animal at the edge of the canal and saying the words given below. The animal is usually a pig, but I know of cases in which an ox has been sacrificed. The animal is killed in such a position that the blood spurts into the ditch, while the master of ceremonies recites the following:

Ditch, this blood is spurted into you in order that your current may be as strong as the current of this blood.<sup>8</sup>

The body of the animal is then dragged along the bed of the canal up to the land to be irrigated.

It is also a very common practice to sprinkle the route of the canal with blood before starting to dig. The throat of a pig or chicken is cut, and the animal is dragged along the line of route for this purpose.

I know of an authentic case which occurred near Laoag, Ilocos Norte, where a dog's blood was used for sprinkling a piece of ground which was to be leveled to make a rice field, the dog being eaten afterward. But in this case the workers were not Ilocanos but Tingians working for an Ilocano. Whether

<sup>8</sup> *Kali naisuyat kenka daitoi á dara tapno iti peggesna ñga agwayawai padaen kuma ti danummo iti pigsana ñga agayus.*

Ilocano peasants sprinkle blood on the ground before leveling or clearing ground I do not know positively, but such action would be in line with their practice in canal digging.

I have heard frequently of Ilocanos burying an animal in the masonry of the canal intakes or gates, but I am not able to vouch for the existence of the practice except in one case in which my information seemed thoroughly reliable. In this case the man who had performed the act was an Ilocano living in San Miguel. He informed me that he had buried a chicken alive in the masonry on first constructing it, but on the gate or intake being destroyed by a flood he had consulted a Tingian as to what he should do. The Tingian recommended that a dog should be buried alive when the gate was reconstructed. This was done, and according to my informant the gate has stood solidly ever since.

Before taking leave of the subject of irrigation in Ilocos Norte, I wish to mention certain unsatisfactory features. One is the danger of a local boss who initiates a canal-building society or gets control of one already formed claiming the proprietorship of the works. This is especially liable to be the case after the lapse of time has eliminated the original constructors. There are several factors which may favor his success in such an attempt. As the chief, he controls the original of the document organizing the society. It is not difficult to cause this paper to disappear in a plausible manner; for example, during one of the typhoons or fires which frequently destroy the flimsy houses of a provincial town. The frequency of destructive fires in the towns of Ilocos Norte during the time covered by the memory of men still living is very striking. Even if the documents were kept at the town hall, the danger would be but little lessened. It would seem that papers of such importance should be kept in the provincial building at the capital, certified copies being furnished to the chiefs of the various societies.

A point in which improvement is possible lies in the direction of definite provision for an equitable distribution of water. It may be that there are irrigation agreements in Ilocos Norte in which such provision is made. I can only say that I have seen none in the various agreements that I have read, which were chosen at random in different sections of the province. It seems to have been assumed by those who signed these papers that the proposed works would supply sufficient water to all concerned under any circumstances. In point of fact, it happens with great frequency that there is not water enough

to go around under the present haphazard way of distributing it.

It is probable in the extreme that there are also considerable possibilities of improvement in some cases in the line of coördination of the work of the various irrigation societies operating in a given region. The societies have been organized independently of each other at different times to meet the problems of groups of cultivators who have had an eye solely to their own needs. The consequence has been that some effort has been expended and some work accomplished which might have been either avoided altogether or made to pay greater returns by coördination of effort with other groups. It is, however, a merely academic wish to desire such coördination at the present time. No substantial improvement in this direction should be expected as long as the irrigation societies carry on their activities without supervision by the Insular Government.

Finally, in cases where the Government takes action, such, for example, as taking over existing systems of irrigation during the process of creating new systems, it is necessary to exercise great vigilance to protect the interests of the small peasant. It is easily conceivable that in such cases a few influential men might claim exclusive right to compensatory water rights granted by the Government which ought in justice to be divided among a large number of persons who helped to build the old systems under a coöperative plan or whose ascendants did so. The importance, in this connection, of a scrutiny of the original papers organizing the local irrigation societies is self-evident.



## ILLUSTRATION

PLATE I. Feed canal in the cañon of the Bacarra River. (Photograph by Cortes.)

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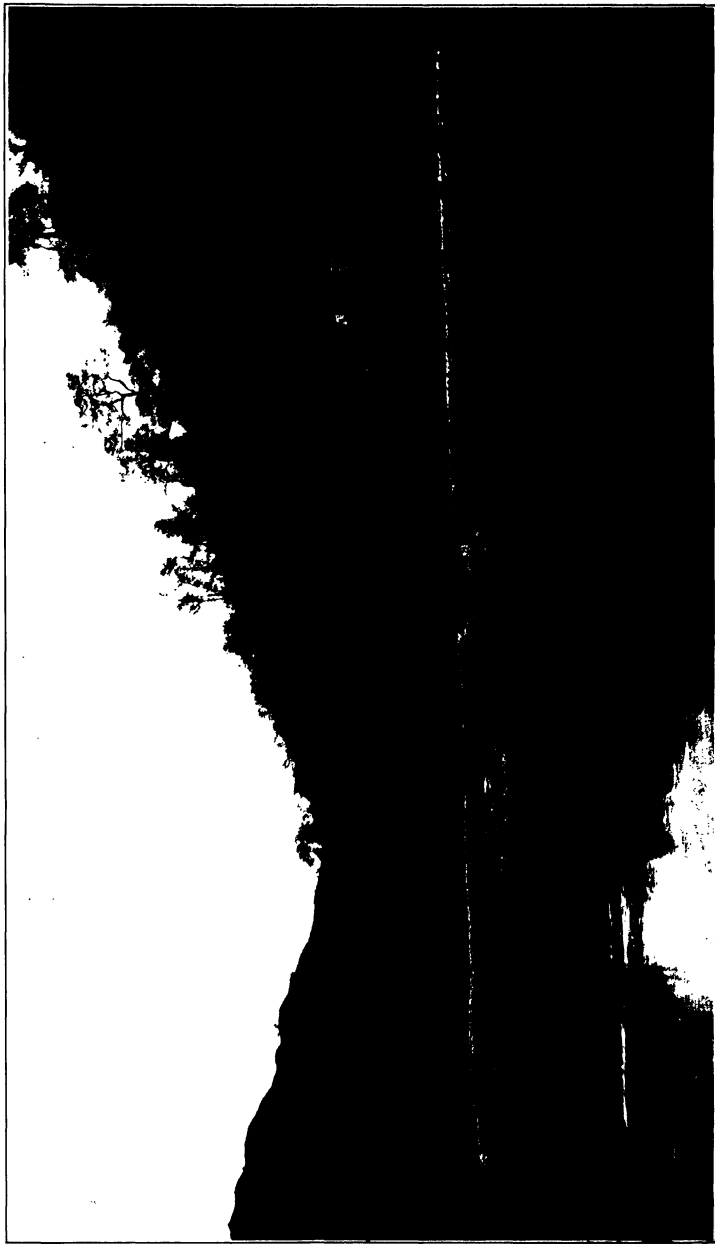


PLATE I. FEED CANAL IN THE CANON OF THE BACARRA RIVER.





## NOTES ON THE POTTERY INDUSTRY IN SAN NICOLAS, ILOCOS NORTE

By EMERSON B. CHRISTIE

(*From the Museum, Bureau of Science, Manila, P. I.*)

### Three plates

Pottery of some sort is in use in every household in the Province of Ilocos Norte. The principal objects are cooking pots, which are also used for carrying and storing water; tobacco pipes; hearths or stoves; extra large jars for molasses or *basi* (a fermented drink made from sugar cane); various sorts of bowls; linings for wells; and bricks. Pots, jars, pipes, and stoves are in practically universal use. Thus, although the money value of pottery used in any one house is small, the sum total for the province amounts to a considerable investment.

Part of this money goes out of the province. The large jars mentioned are not, as far as I know, made in Ilocos Norte. Some come from Manila and a good many from Vigan, Ilocos Sur, as containers of molasses or unrefined sugar. There are in Vigan a number of Chinese who manufacture these large jars.

The manufacture of bricks and pipes in Ilocos Norte is diffused among several towns. Laoag, the capital, and San Nicolas make bricks; Piddig and San Nicolas make pipes. But the manufacture of by far the largest class of earthenware used in the province, namely, cooking pots, is almost entirely confined to San Nicolas. I venture to say that if statistics on the subject were available they would show that four-fifths of all the pottery made in Ilocos Norte, as reckoned in money value, is produced in this town.

San Nicolas is a town of some eleven thousand inhabitants, situated almost directly across the river from Laoag. Its lands, as at present cultivated, do not suffice for the inhabitants, and several hundred persons derive their means of subsistence in whole or in part from the manufacture of pottery vessels, especially those for cooking and for holding water.

Bricks are made to a limited extent, mostly for local use. Those I saw were poorly molded, and seemed to be poorly baked

as well. The manufacture of bricks constitutes an industry of scarcely any importance.

Linings for wells are made mostly by men, owing probably to the fact that they are comparatively large pieces and require some strength to manipulate. They are frequently made to order, in which case their size, of course, depends on the diameter of the wells for which they are intended. They are not cast in molds, but are built up by hand in the open air by adding one layer of wet clay to another. They are then left to dry in the sun, after which they are covered, out of doors, with rice straw and other combustibles which are fired. Before the firing, they are commonly smeared with a mixture of red earth and water which gives them a uniform bright red color. These linings are usually about 30 centimeters in height. They are superimposed one upon another in wells, the top one projecting above the well mouth and serving to keep dirt from falling in.

For making pipes and cigar holders, clay is dug, dried, pulverized, and sifted. The clay is then mixed with considerable water, and is left to stand. After a good deal of sediment has settled at the bottom, the water is drawn off and left to stand in another vessel. The sediment which sinks to the bottom of this second vessel is necessarily the finer part of the original clay.

The tools used in making pipes and cigar holders consist of a knife, a few small pieces of bamboo, and one or two slender metal rods (Plate III, fig. 2). The worker, who in almost all cases is a woman, keeps a small dish of oil at hand in which to dip her fingers or her tools from time to time, to prevent them from sticking to the clay. In default of oil, she may use perspiration from her forehead or nose. After the clay has been well kneaded, the object is shaped with the fingers, then trimmed off with the knife. The bowl of the pipe is then cut out with the oblique cutting edge of one of the bamboo instruments. A thrust or two with one of the metal rods makes the opening for the smoke to pass through. After this, the pipes or cigar holders are left to dry for a time. Then they are placed in an earthenware bowl filled with combustibles, usually consisting of rice straw. The straw is set on fire and bakes the objects.

San Nicolas pipes and cigar holders are usually plain. A little ornamentation is sometimes produced by incising the unbaked clay with the edge of a piece of bamboo. Many of them are blackened by being covered, while still very hot, with rice

bran. The bran is imperfectly consumed, and leaves a black deposit on the clay.

Undoubtedly the principal clay product manufactured in San Nicolas is cooking pots. Thousands of them are made every year. The clay is dug from open pits on the outskirts of the town, dried, beaten into dust, and sifted. It is then moistened and kneaded. Some sand from the river is mixed with the clay to prevent cracking. Then the woman shapes the mixture into the form of a short thick cylinder and lays it on a round board. This board is laid on another board, but it is not connected with it by a bearing pin. From time to time she gives the upper board a turn with one hand while she works the clay with the other. Thus she gets some of the effect of a wheel. She has a dish of water at hand, and frequently dips her fingers and her tools into it to prevent sticking. At first she uses only her fingers to shape the vessel; later she uses a smooth stone which she holds against the inner surface of the vessel with her left hand while working on the outside with a paddle in her other hand. Her tools consist of a stone, a shell, and paddles of various shapes and sizes. With the paddles she beats the outside of the vessel, causing it to spread. When the vessel is fairly well shaped, she lays it aside for a time to set and partially to dry. After this, she starts working with it again, giving the last touches. When the vessel is completely formed, she smooths the outside with a shell. Then she may give it a few strokes with an incised paddle to impress on it a simple pattern. It is common for the worker to smear the outside of the vessel with red earth mixed with water, in order to give it a uniform red color. If she does not do this, the clay, which is grayish brown before being fired, turns a poor and irregular red color on being burned. As in the case of pipes, it is often desired to give the pot a black color. This effect is secured in the same way as with pipes.

A few hearths or stoves and bowls of various sizes and shapes are also made. The bowls are made in the same way as the cooking pots. The hearths or stoves are built up in layers in the open air, and are then covered with straw and other combustibles and burned.

Pottery making in San Nicolas is strictly a household industry. To a large extent it takes the place in the family economic system which weaving by hand occupies in most other towns of the province. A woman working steadily at making pottery may earn from 25 to 30 centavos (12.5 to 15 cents United

State currency) a day, but in fact the work is taken up and dropped according to the family convenience or needs and according to the state of the weather. As all cooking pots are burned out of doors, without shelter of any kind, the work is interrupted by rainy weather.

Just as the manufacture of pottery is strictly a household industry, so the distribution is usually a family affair. It is true that some one occasionally buys a cargo of pottery from the manufacturers in San Nicolas and takes it up or down the coast in a sailboat. But speaking broadly, each family that makes pottery sells it to the ultimate consumer. This part of the work is also in the main the women's affair. There are several towns within a few kilometers of San Nicolas. Nearly every morning, if the weather is favorable, San Nicolas women may be seen starting for the markets of these towns, carrying on their heads large trays loaded with earthenware, which ordinarily consists of cooking pots. The pots are kept from falling off by a network of cords. The price at which the women retail the pots at the markets varies from 1 to 5 centavos according to size. It often takes a whole day to dispose of 50 centavos' worth of pots.

When the desired market is at a considerable distance from San Nicolas, the men of the family often take charge of the distribution. They do not use ox carts much for freighting earthenware because of the danger of breakage, but sling the vessels on the end of the carrying pole (*pin̄gga*) borne on one shoulder. If the load is too heavy for one man, it is slung from the middle of the pole and two men take each one end of the pole on a shoulder. At harvest time, which is, of course, the best season for sales, San Nicolas men may frequently be seen carrying their wares even in remote barrios of the province. Sales at this time of the year frequently take the form of barter, the purchaser of earthenware paying in unhusked rice. At this time of the year, also, a considerable number of people from all parts of the province go to San Nicolas to trade their rice for pottery.

It is impossible to state accurately the value of the annual production of San Nicolas pottery. Taking into account the fact that this town practically supplies the whole Province of Ilocos Norte, and even sends some wares to Cagayan, I think that it amounts to a business of not less than 10,000 pesos a year, and probably reaches from 40 to 50 per cent higher.

## ILLUSTRATIONS

(Photographs by Cortes.)

### PLATE I

- FIG. 1. Potters kneading clay.  
2. Women shaping pottery.

### PLATE II

- FIG. 1. Interior of potter's house.  
2. Woman burning pottery.

### PLATE III

- FIG. 1. Peddler of pottery.  
2. Woman making pipes. The deep bowl on her left is for burning the pipes.





Fig. 1. Potters kneading clay.



Fig. 2. Women shaping pottery.







Fig. 1. Interior of potter's house.



Fig. 2. Woman burning pottery.





Fig. 1. Peddler of pottery.



Fig. 2. Woman making pipes. The deep bowl on her left is for burning the pipes.



# HISTORY OF THE SPANISH NORMAL SCHOOL FOR MEN TEACHERS IN MANILA, 1865-1905 \*

By ANDREW W. CAIN

(*From the Bureau of Education, Manila, P. I.*)

Four plates

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BIBLIOGRAPHY.

\*A thesis written to satisfy, in part, the requirements for the degree of master of arts in the University of the Philippines.

## INTRODUCTION

This study was undertaken for the purpose of determining the extent to which the Spanish Government in the Philippine Islands provided for the professional training of its public-school teachers. It will be noted that prior to the promulgation of the royal decrees of 1863 there was nothing in the Philippines that could be termed public education. Previous royal orders regarding education had been issued from time to time, but as no provisions were made for putting these orders into effect they all came to naught.

When educational reform was finally inaugurated in 1863, and thereafter, the work was carried on largely through the Jesuits. The Jesuits have a well-established reputation as a teaching order. After an exile of nearly a century, they were permitted to return to the Philippines in 1852 upon the conditions that their missionary fields be limited and that they devote a part of their time to the spread of education. The Jesuits gave Spain that assistance which made possible the founding of a system of public education in the Philippines. The normal school was to be at the head of this proposed system of instruction. When the plan for the establishment of the normal school was finally completed, the school was given over to the Jesuits to be administered as they thought proper. The part of the Government in the undertaking was merely to pay the expenses.

This article is based largely upon original documents which heretofore have not been published or translated into English. Lack of space forbids my mentioning the names of many to whom I am under obligations for assistance. Especial thanks are due Father Marcial Sola, prefect of studies in the Ateneo de Manila, for placing at my disposal the archives of the Ateneo; Father Miguel Marti, secretary of the Central Seminary of St. Xavier, for courtesies extended in allowing me to examine the registers and libraries of that institution; and finally to Mr. Alexander E. W. Salt, instructor in history in the University of the Philippines, for advice, helpful suggestions, and assistance rendered throughout the preparation of this paper.

## PRELIMINARY PLANS

On February 7, 1855, Don Manuel Crespo y Cebrian, governor-general of the Philippine Islands (1854-1856), appointed a commission to draft a set of resolutions for the schools of the Philippines, in compliance with the royal order of November

3, 1839. This commission was given the following instructions for guidance in its deliberations, and empowered:

1. To draft a course of study for the schools of both sexes, paying particular attention to the teaching of the Spanish language; and to provide for uniform teaching in the schools.

2. To determine the number of men and women teachers necessary for the service of the public schools, and to estimate the amount of revenue required for their support.

3. To report upon the necessity of a normal school, the advantages to be derived therefrom, the advisability of undertaking the establishment of such a school, and to draft a plan for a school from which trained teachers suitable for teaching in the provinces might graduate.

This commission held but few meetings, and accomplished but little during the first five years of its existence. Governor-General Ramon Maria Solano y Llanderal (1860), moved by the tardiness of the commission, delegated an official from the office of the executive secretary to draw up a plan for reform along lines similar to those intrusted to the commission. Within two weeks, this official had completed the work assigned him, and his promptness had the effect of spurring on the commission to the completion of its task.

The principal point of debate during the sessions of the commission was the teaching of Spanish. The opposition was led by Father Francisco Gainza, vice-rector of the University of Santo Tomas, one of the most active and influential members of the commission.<sup>1</sup> His chief argument against the teaching of Spanish was that if there was a uniform language in the Philippines the door would be opened to Protestantism. It was also pointed out by him that Russia and Prussia were unable to force their respective languages on unhappy Poland, and their failures were held up as examples and warnings to Spain. The opponents of Spanish acted also from political considerations. They hoped that by keeping alive and in opposition the several language groups, they would isolate the many separate sources of insurrection. The commission finally voted to make Spanish obligatory.

A report was rendered in 1861, nearly six years after the appointment of the commission,<sup>2</sup> and two years later the Madrid officials promulgated the famous royal decrees, which were by far the most significant legislation ever produced by the

<sup>1</sup> See No. 24 of the bibliography.

<sup>2</sup> For reports of other commissions and individuals, see Nos. 10 and 32 of the bibliography.

Spanish Government for the cause of public education in the Philippines.

#### THE ROYAL DECREES OF 1863

The royal decrees, promulgated by Queen Isabela II on December 20, 1863, were the foundation of the system of state education in the Philippines.<sup>3</sup> A résumé of those decrees which relate to the Spanish Normal School for men teachers is given in this chapter, as they form the basic legislation upon which the school rested, and throw light upon its subsequent history.

In the opening article we read:

*A normal school for primary teachers is to be established in the city of Manila, in charge of and under the direction of the fathers of the Society of Jesus. The normal school is to serve as a seminary for religious, obedient, and trained teachers for the management of schools of primary instruction for the natives throughout the whole Archipelago.*

#### GENERAL PLAN OF ORGANIZATION OF THE NORMAL SCHOOL

The decrees provided for a director, at least four teachers, such brother coadjutors as might be necessary, one porter, and indispensable subordinates.

The director was to be the official superior, and was to exercise authority over all the teachers, employees, and students of the school. He was to plan the education and direct the training of students, to preside at all literary ceremonies, to visit the rooms, to preserve discipline, to correct any infringement of rules, and, when necessary, to expel pupils.

Of the four or more teachers, one was to be spiritual adviser, teacher of sacred history, morals, and religion, and was to preside at all religious ceremonies. Another was to be prefect of manners, to accompany students in their walks, and to attend to the general ceremonies incident to the interior life of the institution. The remaining teachers were to handle the other subjects of the curriculum.

#### MEANS OF SUPPORT

The royal decrees provided that the normal school should be supported out of the central treasury of ways and means, but as the latter was subsequently suppressed the normal school was thereafter supported by a charge upon the local funds.<sup>4</sup>

<sup>3</sup> See No. 14 in the bibliography.

<sup>4</sup> For an estimate of the amount of money necessary for the support of the normal school, see page 150. For an account of the final withdrawal of Government support, see page 166.



## THE COURSE OF STUDY

During the first four years after the opening of the normal school, the course of study was to cover a period of two years. Thereafter, the time was to be increased to three years. For the purpose of perfecting their studies, graduates were to be permitted to return to the school for a year of postgraduate work, in case this did not interfere with the work of the undergraduate students.

The decrees provided that the course of study should comprise the following subjects: Reading, writing, arithmetic, music, rules of courtesy, religion, morals, sacred history, Spanish geography and history, practical agriculture, physical and natural science, geometry, the Spanish language, and the elements of pedagogy.

The director of the normal school was to select a list of books for use in the school. Upon the approval of the superior civil government, these were to become the textbooks of pupils and were to be used as the basis of the explanations given in the schools. When necessary, these texts were to be revised in such a way as better to meet educational conditions.

In the same locality as the normal school, but separated therefrom, was to be a primary school composed of nonresident boys. This was to be under the supervision of a teacher of the normal school, and was to be used as a training school for the students. As a requisite for graduation, each student was to be required to do at least six months of practice teaching.<sup>5</sup>

Provision was made for a private examination at the end of each month in each of the classes of the normal school and also for an examination at the close of the first semester, covering all of the subjects studied up to that time. As a reward for deportment, application, and progress, as well as a mark of punishment for bad manners, laziness, and a lack of interest, the ratings of all pupils were to be read monthly in the presence of the students, the instructors, and the director. At the close of each year, public examinations were to be held in the presence of the government officials and other distinguished persons of the capital. At the close of the examinations, the results were to be announced and prizes were to be awarded.

## WHO WERE TO BE ADMITTED AS STUDENTS

The decrees provided for regular resident students, who were to be selected from the several provinces in proportion to the

<sup>5</sup> For a description of the manner in which the practice school was conducted, see pages 147 to 149.

population, the total number to be determined by the superior civil government, and for a limited number of day students, who were to come from reputable families living in the capital or in neighboring provinces and to be under the immediate care of parents or guardians who would guarantee that the students would complete their course and become an honor to the institution.

The following were to be the requisite qualifications for entering the normal school. The prospective student was required: (1) To be a native of the Spanish dominions; (2) to be 16 years of age;<sup>6</sup> (3) to be free from contagious diseases and of sufficient health to enable him to fulfill his duties as a teacher; (4) to possess certificates of good conduct; and (5) to be able to speak the Spanish language, to know the Christian doctrine, and to be able to read and write well.

#### COST TO PUPILS

The regular resident pupils, who were to be selected by the council of the superior civil government, were to receive free support, medical treatment, school equipment, and tuition, but were to be required to furnish their own clothing.<sup>7</sup> The supernumerary resident students—that is, those students not selected by the government—were to pay 8 pesos per month for board. In 1866 this amount was raised to 10 pesos per month, in 1870 it was fixed at so much for each study pursued, and at a still later date the price was raised to 140 pesos a year.

Each student was required to provide himself with certain specified articles of clothing. The total annual cost of his clothing was reckoned at 40 pesos.

After leaving the normal school, the regular resident students were required to serve the state for a period of ten years as teachers in the public primary schools.

#### INTERIOR REGULATIONS

The royal decrees provided further that “special regulations shall detail minutely the organization of the normal school.”<sup>8</sup>

<sup>6</sup> The minimum age limit was later reduced to thirteen.

<sup>7</sup> The government pensioners received an allowance of 10 pesos a month. From this amount they paid a part or all of their expenses.

<sup>8</sup> The most important of these regulations are given on page 151 et seq. The students' daily program of duties is given on page 136. For the details of the student's conduct in and about the building, see No. 26 of the bibliography.

The decrees set aside the following holidays for the school: Sundays, feast days, Ash Wednesday, All Saints' Day, the birthday anniversaries of the Spanish sovereigns, the day of the patron saint of the superior civil governor, twelve consecutive days beginning from Christmas eve, the three days preceding Lent and those from Holy Wednesday until Easter Sunday. The students were not to leave the institution during any of these days. It was provided that there should be a long vacation of one and one-half months during the period of greatest heat. By a later decree, the vacation period was made to include the months of April and May.

Regarding punishments, the decrees ran as follows:

The punishments shall be public censure, deprivation of recreation and walks, banishment and separation from the other students, and if these are not sufficient the definitive punishment shall be expulsion from the school. Expulsion shall take place because of any contagious disease, for notable laziness and lack of application, for serious lack of respect to the teachers, and for bad conduct or depraved morals.

#### CERTIFICATES

It was provided in the decrees that students of the normal school who successfully completed all the work of the three-year course and passed the prescribed examination with a rating of "excellent" were to receive certificates showing their attainments<sup>9</sup> and were to be regarded as eligible to teach in the intermediate schools. Those who completed the work in like manner and passed the examination with a rating of "good" or "fair" were to receive certificates indicating their fitness to teach in the primary schools. Students who completed all of the work but failed of promotion on account of low ratings in the examination were to be offered employment as assistant teachers.

#### RESPONSIBILITIES AND PRIVILEGES OF GRADUATES

Regular resident students who received the benefits of the normal school were to teach in the public school for ten years at stations to which they might be assigned by the superior civil government. Those who left the school of their own accord or were taken from the school by their parents, as well as those who were expelled for lack of application or for bad conduct, were required to repay to the state the amount expended on their education.

The teachers appointed from the normal school were not to

<sup>9</sup> Facsimiles of certificates are given in the plates.

be discharged except for legitimate cause and by resolution of the superior civil governor, after hearing the interested party. The causes for which an action might be brought were faults of religion, public or private immorality, lack of zeal in the fulfillment of duty, and abandonment of the Spanish language in the explanations or in the ceremonies of the school.

Teachers and assistants were to be exempt from personal service as long as they discharged their duties as teachers, and even after they ceased to perform these duties, provided they had been in the teaching service for fifteen years.

After five years of service for teachers and ten years for assistants, these persons were to become *principales*.<sup>10</sup>

It was provided that teachers who were disabled in the discharge of their professional duties were to receive a pension, subject to certain restrictions. The same rule was to apply to those who reached the age of 60 in the teaching service. After twenty years of service, all teachers were to receive a pension equivalent to half the retiring salary. After thirty-five years' service, the pension was to be three-fourths of the retiring salary.

Teachers and assistants with certificates were to be preferred for appointment to various government positions after ten and fifteen years' service, respectively. No examination or other test of fitness was to be required.

In addition to their regular salaries, teachers were to receive quarters for themselves and their families and fees paid by wealthy pupils.

#### THE EQUIPMENT OF THE NORMAL SCHOOL

A list of the equipment provided for the normal school throws light upon the life of the student body, the kind of instruction given, and the size and importance of the institution. Moreover, it emphasizes the fact that the Spanish Normal School, like nearly all of the other schools of the Philippines during this period, was a combination of school, dormitory, and chapel. The following is a list of the equipment with which the school was provided on July 1, 1866:<sup>11</sup>

*Reception hall.*—Three sofas, 3 armchairs, 12 black chairs, 12 small chairs, 2 small tables, 1 image of the Virgin of the Immaculate Conception with bell, 1 picture.

<sup>10</sup> The important people of the town. They enjoyed social distinction, and had a limited share in the administration of the government.

<sup>11</sup> See No. 9 of the bibliography.

*Class rooms.*—Sixteen writing tables with 16 railings, 4 extra tables, 1 small revolving table, 2 tables with low benches, 2 easy-chairs for the teachers, 1 large blackboard mounted on 2 supports, 4 easels, inkwells, blotting paper, pens, ink, chalk, and sponge.

*Study hall.*—Five large double tables, 5 dozen American chairs, 4 lamps, maps with chains and frames, pictures, charts, and 1 wall clock.

*Gymnasium and baths.*—One trapeze, 2 ninepin sets, 6 large and 4 small earthen jars, and bath towels.

*Chapel and sacristy.*—One box for ornaments, 1 cupboard for the sacristy, 2 confessional boxes, 1 crucifix, 1 laver, 6 coverings for the altar together with 6 sets of small cloths, 1 tabernacle, 6 small brass candlesticks, 2 gilded candlesticks, 1 chalice, lamps, vinegar cruet, carpets, wax tapers, and holy-water basin.

*Students' dormitories.*—Fifty iron bedsteads, 50 beds, canvas, thread, rope, 60 narra screens, 18 pieces of rough dimity, 50 chests and small cupboards for the rooms, 20 pieces of coconut fiber for curtains, 45 commodes, and 17 dozen towels.

*Rooms of director, fathers, and lay brothers.*—Five bedsteads, 5 mosquito nets, 2 large tables, 2 small tables, 24 chairs, 7 washstands, 7 shoe boxes, 4 writing desks, 6 easy-chairs, 6 commodes, and 3 cupboards.

*Dining room.*—Six large tables, 2 dozen chairs, 2 couches, 12 benches, 3 cupboards, 12 dozen plates, 8 dozen pieces of a dinner service, 8 large spoons, 24 dozen serviettes, 8 dozen glasses, 8 dozen cups, 6 pepper shakers, 5 coffee sets, 20 water bottles, 5 servers, 8 soup tureens, 8 preserve dishes, and table linen and oilcloth covers.

*Kitchen.*—One cooking range complete for more than 100 persons, 1 heater, 17 saucepans, 1 colander, 5 baking pans, 2 stewpans, 1 funnel, 2 coppers, 4 knives, 2 cleaners, 3 ladles, 3 skimmers, 2 heaters, 12 jars, and 30 dishes.

*Hospital.*—One cupboard with glass doors, 1 large table with 10 drawers, 2 armchairs with stands, and 1 complete medicine chest.

*Servants' room.*—Eight bamboo beds, 8 pillows, 8 petates, 12 coverings, 4 small tables, 2 benches, 2 pairs of tongs, 2 zinc baskets, 2 benches, 6 clay filters, 2 large saucepans, 6 small tables, 8 baking pans, 8 frying pans, 2 coffee pots, 2 milk jugs, 2 small basins and beaters, 1 bread grater, 2 sieves, 1 lantern, 3 cupboards.

*Miscellaneous equipment.*—Altar, cross, chalice, eucharist set, missal, incense, bread, wine, rochets, 3 wardrobes, 2 bookcases, pictures for the corridors, 1 clock, 40 flower pots, 9 bulletin boards, 6 curtains, 14 table lamps, 4 copper candlesticks, 8 benches, brooms, and feather dusters.

The equipment was at this time valued at 6,000 Spanish pesos.

## THE FOUNDING OF THE NORMAL SCHOOL, 1865

### EXISTING EDUCATIONAL CONDITIONS

At the time of the founding of the normal school, primary instruction was exceedingly meager. In most schools there was no teaching except that of reading and writing, and in many not even the latter. There were very few that gave even the most elementary work in arithmetic, and fewer still that taught

the rudiments of geography and history. Religious instruction was superficial and flimsy, amounting to a mere repetition of the catechism, and there was absolutely nothing taught in the way of morals and manners.

No other state of affairs could be possible, as any one who desired to teach was permitted to do so, even if he were prompted only by the most audacious ignorance: teachers were often found who could barely read and write.<sup>12</sup>

To remedy this condition of affairs, the government proposed to establish a normal school, and created a board composed of some of the most respectable and competent men in Manila to study conscientiously and in detail the manner and method of instituting primary teaching. This board, after six months of careful investigation and frequent discussion, submitted a favorable report, setting forth a plan of elementary education for the natives, to be conducted under the auspices of the normal school. It was not the purpose of the board to provide a high academic education which would not be necessary for the teachers, but rather to provide an ordinary, elementary training, suitable for the class of individuals for whom it was intended, and at the same time to make the training adequate for those who might afterward enter commercial life or take higher academic work.

#### THE FORMAL OPENING

As we have already seen, the organization and management of the normal school was intrusted to the fathers of the Society of Jesus. Those who were to take charge of the school arrived in the Islands late in June, 1864, having embarked at Cadiz, Spain.<sup>13</sup>

After resting for a few days, these priests prepared for the opening of the normal school in a building located on Calle Palacio in the Walled City, Manila. The inauguration and opening exercises of the school were held on January 23, 1865, the Governor-General, Rafael de Echague of Birmingham (1862-1865), presiding. Attending this function were the members of the Superior Commission of Primary Instruction and many other noted guests, all of whom showed their pleasure at being present at the inauguration of the first normal school in the Philippine Islands.

<sup>12</sup> See No. 27 of the bibliography.

<sup>13</sup> *Historia de la Escuela Normal de Manila*, a ten-page MS. in the Ateneo.

On the following day, Father Francisco Xavier was appointed director of the school, the priests Jacinto Juanmarti and Pedro Lacasas were appointed teachers, Gabriel Pujol and Segismundo Berengueras taking charge of the domestic arrangements. Classes were opened, and a number of pupils were matriculated.

On December 3 of the same year, the great apostle of the Indies, San Francisco Xavier,<sup>14</sup> was declared patron of the school.

#### EARLY HISTORY OF THE NORMAL SCHOOL

The first public examinations and the distribution of prizes took place about the middle of January, 1866. These examinations were presided over and prizes were awarded by the superior commission of instruction, and were attended by persons of religious distinction.

During the second year the attendance increased to such an extent that additional teaching facilities had to be provided. The course of study was also better organized, and the pupils were required to pursue the various subjects in accordance with the regulations.

In April and May the apartments on the ground floor of the building were rearranged, in order that the practice school of primary instruction provided for in the decrees might be established. This department was maintained as a model school for the benefit of third-year students in the normal school proper. The classes in the training department were composed of pupils ranging in age from 6 to 12 years and residing in the vicinity of the school. The instruction included all the subjects of a primary education, special attention and time being given to the teaching of Spanish.

On the morning of December 3, the anniversary of the patron saint of the school, solemn mass was held in the chapel. The afternoon of the same day the hall was beautifully decorated with little colored lanterns and the pupils sought relaxation in a comedy and in a variety of games, accompanied by the orchestra.

The pupils were not without spiritual instruction and admonition. They had daily exercises and instruction in offerings, masses, spiritual lectures, and rosary, and were taught to confess and receive the sacrament once a month.

<sup>14</sup> The name of Father Francisco Xavier, the first director of the normal school should not be confused with that of San Francisco Xavier (1497-1552), the apostle of the Indies.

The final examinations were held and prizes distributed December 19 to 21, 1866. On this occasion, 14 pupils, who had completed two full years' work, were granted the title of teacher of primary instruction. This was the first class to graduate from the normal school.

In April, 1867, the first examinations were held in the training department, the pupils who had distinguished themselves in studies and conduct being awarded prizes consisting of books and medals.

In December of this year the general examinations for the pupils in professional courses were held, and 25 students received the title of teacher.

Early in 1868 the director and teachers formerly chosen were assigned to other duties in the mission, and Father Alejandro Zans was appointed director. Fathers Pascual Barrado, Jose Casadovale, and Santiago Buntas were appointed teachers.

The number of pupils having increased, it was found necessary to provide for 20 additional boarders.

At the end of the school year examinations were held and 27 students were granted certificates of graduation.

By the superior decree of March 22, 1869, the date for the opening of the school year was changed from January to June, for the greater convenience of pupils and teachers. During this year 127 students were registered and 29 received the title of teacher.

The year 1870 was uneventful except that the personnel of the administrative and teaching staff was increased to 8—4 priests, 2 brothers, and 2 student assistants. A class of 39 students was graduated.

In 1871 news came from Madrid of the publication of the Moret decree transferring the charge of the normal school to the secular clergy. This order was received in the Philippines with great dissatisfaction by those who had been intrusted with the work of the normal school. On the other hand, there were those who welcomed the change, as they believed it signified greater progress. Arrangements were finally made for the withdrawal of the decree before the end of the year.

As the school year drew toward a close, examinations were held in the two grades of the training department and in all classes of the normal school. The director and other government officials were well pleased with the results of the examinations,



and on April 5 prizes were awarded and diplomas issued to 39 graduates.

At the opening of the school year in June 125 new pupils were admitted and a considerable number turned away for lack of accommodations.

Two material changes in the internal regulations of the school were effected at this time. The first of these prescribed the time and manner of making confessions by both boarders and day pupils. The other pertained to the inspection of the students in the evening. A priest was placed on duty as door-keeper, and the passing in and out of the building after supper was thus regulated.

The feast of San Francisco Xavier was celebrated with especial joy. A comedy was given, two balloons were let go, and the sky was brilliantly illuminated with hundreds of rockets.

In 1872 occurred the famous Cavite revolt, but the authorities of the normal school were pleased to note that this did not have any apparent effect upon the student body.

In 1874 the superior civil government of the Philippines decreed that no petition for admission to the normal school should be sent except through a provincial governor. During the same year other decrees were issued fixing the number of resident pupils.

On June 22, 1880, a royal order of the ministry of the colonies set aside a permanent sum of money to be assigned in the budget for the maintenance of the school. It was during the same year that the building was destroyed by an earthquake. The classes were for a few days accommodated at the Ateneo, being held in hallways, corridors, and every other available space large enough for a recitation. As it was impossible to continue this arrangement for a long period and as no other house sufficiently large could be found, the mission of the company of Jesuits rented to the government for the use of the school a building which it possessed in the neighboring pueblo of Santa Ana. This was occupied by the school for a period of six years. Meanwhile, seeing that no other means were forthcoming for giving this school a suitably large building and as the house at Santa Ana was inconveniently located, the mission resolved to take under its care the enterprise of erecting and equipping a new building. This structure, situated in the district of Ermita, was the home of the normal school from 1886 until the institution finally closed its doors.

## DISTRIBUTION OF GRADUATES

The following table shows the places of residence of the graduates of the normal school from 1865 to 1887.

Peninsula teachers .....	8	Laguna .....	43
Abra .....	4	Leyte .....	20
Albay .....	12	Manila .....	230
Antique .....	4	Mariano (Guam).....	2
Basilan .....	1	Masbate .....	2
Bataan .....	9	Mindoro .....	14
Batanes .....	3	Misamis .....	9
Batangas .....	77	Morong .....	8
Bohol .....	20	Negros .....	3
Bulacan .....	84	Nueva Ecija .....	8
Cagayan .....	23	Nueva Vizcaya .....	14
Calamianes .....	2	Pampanga .....	54
Camarines .....	14	Pangasinan .....	48
Capiz .....	40	Romblon .....	7
Cavite .....	31	Samar .....	18
Cebu .....	23	Surigao .....	11
Cotabato .....	1	Tarlac .....	4
Ilocos Norte .....	45	Tayabas .....	27
Ilocos Sur .....	42	Union .....	42
Iloilo .....	38	Zambales .....	14
Infanta .....	1	Zamboanga .....	7
Isabela .....	9	Total .....	1,076

## PROGRAM OF DUTIES

The distribution of the time of resident students was as follows:

a. m.	p. m.
5.00 Rise.	12.30 Lunch, recess.
5.30 Mass.	1.45 Rest.
6.00 Bath, study.	2.15 Study.
6.55 Breakfast, recess.	2.45 Recess.
7.25 Recitations.	2.55 Recitations.
10.00 Recess.	5.00 Go out from the classes.
10.10 Drawing, music.	6.00 Rosary and spiritual lecture.
11.10 Study.	6.30 Study.
	8.15 Supper, rest.
	9.00 Inspection, retiring.

## OUTLINE OF SUBJECTS IN THE COURSE OF STUDY FOR ELEMENTARY TEACHERS

The following is an amplification of the principal subjects in the course of study for elementary teachers, and is also the outline upon which the competitive examinations of teachers were based.<sup>15</sup>

<sup>15</sup> For an outline of the subjects required for the degree of superior teacher, see No. 5 in the bibliography.

## RELIGION AND MORALS

1. What is religion and in how many ways can it be considered? What is the natural and what is the true one?

2. Who is God and what are his principal attributes? Why do we say that God is eternal, omnipotent, immense, spiritual, wise, good, kind, and just?

3. What is man? What is the human body? What is the soul and what is the difference between the body and the soul?

4. Of what does the true religion consist? What is worship and in how many ways is it exercised? What is internal worship? Is the internal worship sufficient?

5. What is morality and how is it divided? What is duty? What are good or meritorious actions? What are bad actions?

6. What is meant by moral order and what are its properties? What are laws, natural law, divine law? Civil law?

7. What are punishments and what are rewards? What are natural rewards, positive rewards? Positive punishment?

8. What is conscience? Virtue? Vice? What is the immediate consequence of virtue and what is that of vice? Of what does happiness in this and in the other life consist?

9. What duties have men to God and what is the greatest of them all? How is a knowledge of our duty to God conceived?

10. What duties has man to himself? How should man take care of his soul and his body?

11. Is man compelled to work? What is idleness and what bad effects does it bring?

12. What is suicide? Is suicide licit? What is fame? Can we be indifferent to the acquiring of fame?

13. What duties has man to his equals? How can we contribute to the conservation of our equals?

14. What are the chief duties of children to their parents? After the parents who has the preference? To whom do we owe respect and submission?

15. What duties have the parents to their children? Duties of teachers to their pupils and of the pupils to their teachers. Mutual duties between masters and servants.

16. What is homicide? Is it licit? Do all the duties that we have to our equals require equal accomplishment?

## PEDAGOGY

1. Definition and division of pedagogy. Education and its object.

2. Importance and necessity. Parts that it comprises. Its agents.

3. Difference between education and instruction. Principles of education.

4. Physical education. Importance of air, light, ventilation, clothes, and exercise in physical education.

5. Physical education in the schools. Cleanliness in the school. Other matters of sanitation that require attention.

6. The teacher as a model of cleanliness. How will he inculcate cleanliness in the children? Care of the teacher with respect to air and light in school and with respect to sick children.

7. Necessity of varying the school exercises. Care that the teacher ought to exercise in order that the children may avoid undesirable places.

8. Intellectual education. Of what does it consist? What is perception and how is it developed?

9. Attention. Importance of this faculty and way of awakening it in the children. How is it sustained and how cultivated?

10. Memory. What is it? How make it strong and active?

11. What is the use of imagination? What contributes to its development and what things tend to mislead it?

12. Judgment. What is the importance of this faculty? What exercises contribute to develop it?

13. Esthetic education. Esthetic sentiments.

14. What does a moral education include? What should the teacher do in order that the children may receive a good moral education?

15. How is religious education inculcated? Fear of God. Obedience to his commandments. Means of religious education.

16. Instruction. Purpose, means, and object of teaching.

17. What are methods of teaching? Explain the most important of these.

18. Teaching of the Christian doctrine. Sacred and moral history.

19. Teaching of reading and grades that it comprises. General procedure in this subject.

20. Teaching of writing. Its object. To what is this teaching reduced? Correction of exercises.

21. Teaching arithmetic. Verbal and written exercises.

22. Teaching of Spanish language. Its object and importance. Teaching of Spanish where another language is spoken.

23. Systems of teaching; advantages and inconveniences that each offers.

24. Organizations of the schools according to the existing legislation.

25. What is discipline? Its base. Prizes and punishments. Discretion and judgment ought to be used.

#### SPANISH GRAMMAR

1. Definition of grammar; its division; object of each.

2. Names of the parts of speech. The noun and its various divisions.

3. The adjective and its division. Difference between the noun and the adjective and rule for distinguishing them.

4. Number of nouns. How is the plural formed from the singular. Gender and its division.

5. Declension. Use of each of the cases.

6. The pronoun, its various classes, declension, use.

7. The article, its division, declension, use, and way of distinguishing it from the pronoun in the third person.

8. The verb, its division and accidents in grammar.

9. Moods of the verbs, tenses, ways of distinguishing them and of forming them. Voice and conjugation.

10. Regular and irregular verbs, impersonal and defective. Conjugation of the most common.

11. The participle and its divisions. The way of distinguishing it from the adjective. The verb and its various classes. Adverbial moods.

12. The conjunction. Its various classes. Figures of diction.

13. Syntax and its divisions. Concord and its various classes.

14. The cases of the noun and the rules for each case.

15. The use of the transitive verb, of the preposition, and of the conjunction.
16. What is the accusative construction? The nominative? The relation of each to the verb.
17. Construction after the accusative. Construction of the verbs with the pronouns.
18. The grammatical sentence and its various classes. Of what parts is each made?
19. Syntax. Figures of speech. How many are there and of what does each consist.
20. Prosody. Prosodial accent. Syllabication, diphthongs, triphthongs, words accented on the last syllable, on the antepenult, or on the penult.
21. Rules of accents.
22. Orthography and its parts. Principles that will be used as standards of good orthography with respect to the use of the letters. Spanish alphabet and classification of the letters forming it.
23. Use of the letters b and v. Also of g, j, y, x, and h.
24. Use of i, y, and of m. Duplications of the letters. Use of the capital letters. Punctuation and its signs. Cases in which the use of the comma is common.
25. Use of the period and of the other signs used in orthography. Also of the Roman numbers.

## ARITHMETIC

1. Arithmetic, number, amount, and unit.
2. Entire numbers, fractions, mixed, abstract and concrete, homogeneous and heterogeneous numbers.
3. Numeration and its division into oral and written. Base of a system of numeration, and when is it called decimal? Units of first order, of second order, etc.
4. Different orders of units in the decimal numeration.
5. Absolute and relative value of the cyphers. Modes of writing and reading entire numbers.
6. Addition, subtraction, multiplication, and division. Different names of the signs. The use of these in arithmetical operations.
7. Numbers that can be divided. Even and odd numbers. Prime numbers, numbers divisible by 2, 3, 5.
8. Decimal metric system. How is it distinguished from other systems. Models used to express the multiples and divisions of the unit and way of verifying them.
9. Unit of length, its multiples and divisors. Units of surface, their multiples and divisors and what relation each bears to the immediate higher denomination.
10. Usual unit of volume and relation it bears to its divisors. Usual unit of capacity, its multiples and divisors. Units of weight, their multiples and divisors.
11. Fractions. Numerator, denominator, proper fractions, improper fractions, way of writing them and reading them. How to reduce a mixed number to a fraction.
12. Simplification of the fractions, reduction of the same to a common denominator and way of valuing them.
13. Addition, subtraction, multiplication, and division of fractions.
14. Decimal fractions. Nomenclature of the decimal units, place they

occupy. Way of reading them and writing them. When are they called homogeneous?

15. Addition, subtraction, multiplication, and division of decimal numbers.

16. Approximation of the quotient in an inexact division. Reduction of ordinary fractions to decimal and from decimal to ordinary fractions.

17. Complex and simple numbers. Reduction of a complex number to the simple form. Reduction. Way of making this reduction in the decimal metric system. Reduction from a superior species to another and intermediate.

18. Addition, subtraction, multiplication, and division of complex numbers.

19. Powers of numbers, roots, exponents. Way of indicating a power. Names that the powers receive and how to form them.

20. Square root. Cube root. Way of indicating the extraction of roots. Way of finding the square root of an entire number, of a decimal number.

21. Ratio of numbers, ways of indicating it. Proportion and its fundamental property. Way of finding one of the means.

22. Rule of three and its division. Way of solving it. When is it simple and when is it compound?

23. Partnership. Three cases that may occur and way of solving them.

24. Rule of alligation. Mode of solving it. When is it direct and when inverse? Interest, how to solve interest when simple and when compound.

25. Drafts. Different ways of negotiating them. How to find the real value and the nominal value. Discount of a draft and how to find it.

#### PRINCIPLES OF GEOGRAPHY AND HISTORY OF SPAIN

1. Geography: Its divisions. Astronomical geography, heavenly bodies, fixed and errant stars or planets.

2. Primary planets. What are they? Their double movement. Satellites. Comets. Solar system and that of Copernicus.

3. The sun. Its diameter, volume, and distance from the earth. The moon. Its diameter, volume, and distance from the earth.

4. The earth, its movements. Meridians, equator, tropics, polar circles, and various zones. Horizon. Cardinal points.

5. Physical geography. Figure and dimensions of the earth. Continent, island, peninsula, coast, cape, isthmus, mountain, mountain range, desert.

6. Spring, rivulet, river, torrent, lake, sea, gulf, bay, strait, currents, tides.

7. Atmosphere and elements that constitute it. Meteors. Winds, clouds, rain, lightning, thunder.

8. Political geography. Great divisions of the earth. Races of human species. Government and its principal forms.

9. Europe, its population and location, seas that bound it, its capes, mountains, volcanoes, rivers, islands, and principal straits.

10. Political divisions of Europe. States of the north and their respective capitals.

11. States in central and southern parts of Europe and their respective capitals.

12. Spain. Its population, its boundaries, climate, capes, mountain ranges, and main rivers.

13. Territorial divisions of Spain. Capital of the monarchy. Ultramarine possessions and population.

14. Population, extension, and location of the Philippine Islands. Moun-

tain ranges, rivers, lakes, and more important straits. Territorial divisions. Location and capital of each of the provinces.

15. Asia, its population, location, straits, rivers, and principal mountains. Political divisions and capital of each one of its states.

16. Location and population of Africa. Seas that bound its coasts and large rivers. Political divisions and capital of each one of the states.

17. Location and population of America. Its mountain ranges and large rivers. Political divisions and capitals of its states.

18. To what is the name "Oceania" given? Climate of Oceania, its division, and islands that form each one of the three great divisions.

19. History of Spain. What is it and into how many periods is it divided? First occupants of Spain, Phœnicians, Greeks, and Carthaginians. Purpose that they had in entering Spain.

20. Who were the Romans? Divisions they made of Spain. Resistance of the Spaniards and their glorious deeds.

21. Barbarians of the north who settled in Spain. Kings of that period who are of greatest historical interest.

22. Arabian Spain. Who were the Arabs? Struggle of the Arabs with the Christians. Who was the illustrious Caliph who was a warrior and was feared by the Christians? Who conquered him and what memorable event took place later?

23. Progress of the small monarchy of Pelayos and his brilliant victories. Kings of greater historical importance in this period.

24. The house of Austria. Origin of this dynasty. Kings of this dynasty and their notable deeds.

25. House of Bourbon. Origin of this dynasty. Kings of this dynasty and their principal deeds.

#### PRINCIPLES OF GEOMETRY

1. Object of geometry, divisions of the subjects, kinds of figures.

2. Straight line, curved, broken, mixed.

3. Circumference, radius, diameter, arc, cord, secant, tangent.

4. Degrees in which the circumference can be divided and subdivisions of these.

5. Angles, right, acute, and obtuse.

6. Adjacent angles and value of both angles.

7. Perpendicular, oblique, and parallel lines.

8. Divisions of the triangle because of its sides or angles.

9. Vertex, base, and altitude of a triangle. Value of angles of a triangle.

10. What is a quadrilateral? How are quadrilaterals divided?

11. Parallelogram. In how many ways can it be placed?

12. The polygon and the different value it has according to the number of its sides.

13. The circle, ring, sector.

14. Inscribed and circumscribed polygon.

15. Way of describing a circumference or drawing any triangle or regular polygon.

16. Way of inscribing a regular hexagon in the circumference.

17. Method of finding the area of a parallelogram, triangle, square, and trapezium.

18. How is the area of a regular polygon found, of an irregular polygon, of a circle, of a circular sector?

19. The more important equivalents of the plane figures.
20. Polyhedron, intersections, dihedral and polyhedral angles. Regular and irregular polyhedrons.
21. How many and what are round bodies? How are they originated?
22. Volume of geometrical body and unit of volume.
23. Way of finding the volume of a pyramid, of a prism, and of a rectangular parallelogram.
24. How is the volume of the regular polyhedron, of the cylinder, and of the sphere found?
25. Relation between two spheres of different radii.

## NATURAL SCIENCE

1. Natural science and its division into physics, chemistry, and natural history.
2. General properties of bodies.
3. Three states in which bodies can be found.
4. Movement and its different classes.
5. Anemometers and their use.
6. The barometer, its use, and the principle on which it is based.
7. The thermometer, its use, and the principle on which graduation is based.
8. Instruments for measuring humidity, on what are they based, and what are their uses? How is the electromotive force valued? How is it named when it is of high pressure?
9. Light, how it is propagated, its velocity, and time required to pass from the sun to us.
10. Reflection of the luminous rays, angles they form on falling on a polished body. Refraction of the same.
11. Microscope, eyeglass, and telescope.
12. Lenses and especial property of the convex, of the concave. Who uses the former? Who uses the latter?
13. Colors that a ray of the sun is composed of and how to decompose it.
14. Electricity. Its properties. How is it developed? Different ways of developing it.
15. The magnets, the compass, and the electromagnet and their important applications.
16. Simple and compound bodies. Metals and metaloids, properties of the former and the latter.
17. Oxygen, hydrogen, and nitrogen and their principal properties.
18. Pure water and of what it is composed. The atmospheric fluid and of what it is formed.
19. Minerals. How do they appear and into how many groups can they be divided?
20. Vegetables. How do they appear, and of what are they composed? Divisions.
21. Organs of nutrition and of reproduction of vegetables.
22. Functions of nutrition and functions of reproduction in the vegetable kingdom.
23. Animals. How do they appear and of what are they composed?
24. Nutritive functions for the preservation of the animal.
25. Four great groups into which they are divided. Subdivisions of each of them.



## ELEMENTARY AGRICULTURE

1. Agriculture, its object and divisions.
2. Purposes to which the agriculturist should aspire and conditions necessary to his success.
3. Tillable soil, soil test, and means of improving the soil.
4. Climate for agriculture, its agents and composition of soil.
5. Improvements of the soil and how they are made.
6. How to prepare virgin soil for cultivation.
7. Fertilizer, its different classes and method of application.
8. Special advantages of mineral fertilizers. Plants that need chalk or ashes.
9. Agricultural instruments, their division and the object of their use.
10. Object of agricultural labor, preparatory labor, and labor for cultivation.
11. Principal organs of the plant and parts of the flower.
12. Three ways of planting. Of what do they consist?
13. How many ways are there to water and how are they varied?
14. Time of harvesting and way of preserving the fruits.
15. Among the cereals, what is the richest fruit? How is it planted and irrigated?
16. Two kinds of rice and way of cultivating and cleaning.
17. Planting of maize and cultivation of barley and buckwheat.
18. Cultivation of sugar cane and way of propagating the common bamboo.
19. How are leguminous plants cultivated in the Philippine Islands?
20. Roots and tubercles used for food and how they are multiplied.
21. Preparation of tobacco seed-beds, how the plants are transplanted, and way of harvesting.
22. Lawns. Plants that can form an artificial lawn.
23. Usefulness of animals to the farmer; work animals in the field and their general characteristics.

## CONTEMPORARY COMMENT

## DIFFICULTIES IN THE WAY

The early years of the normal school were not without their vicissitudes. The following were the most pronounced difficulties that confronted the school:

*A lack of competent teachers.*—Father Luengo says: "First of all the normal school needs a sufficient and capable staff."<sup>16</sup> The Jesuit fathers, who had been previously banished from the Islands, were allowed to return in 1852, upon the condition that they devote their attention to higher education and to the missionary fields of Mindanao. Great efforts were put forth to extend the Christian faith to the new charge. A zealous priest writing from Mindanao says:

By the mercy of God, the conquest of heathen people is continuing at a tremendous rate, and I believe that, despite the lack of laborers, God is

<sup>16</sup> See No. 19 in the bibliography.

blessing our efforts so greatly that the day is not far distant when the company of Jesus will say to the Spanish Government: "It is finished." To-day there are many villages that we have settled with converted heathen where we once reluctantly undertook the cure of souls.<sup>17</sup>

This work drew away from the normal school every teacher who could possibly be spared.

*A lack of suitable textbooks in Spanish.*—An observer voices his complaint in these words:

Going along Calle Rosario on a holiday, we saw three book stalls which we thought would be full of pious books. On stopping to examine them, great was our surprise when at one alone we found 35 pamphlets and other books of prose and verse, all in Tagalog. Not one of the three had a single Spanish book. These books (that is, the books seen at the stalls) and certain novels, always in the local dialect, circulate through the villages after twenty years of the most complete legislation as to primary education and the diffusion of the official language.<sup>18</sup>

It is evident that for these and other reasons the abandonment of the normal school by the Jesuits was discussed, but it is equally certain that there was an overwhelming sentiment against such action. Father Francisco G. Martin Luengo, writing to Father Juan Ricart from Surigao under date of January 25, 1881, says:

We have seen the normal school sickening for several years for lack of members of our own order who shall do their work perfectly and freely. The question of abandonment was seriously considered at our conference in Manila in 1877. In my opinion, it would be an irreparable mistake to give up such an institution as the normal school, which is a strong and powerful arm in protecting our power in these Islands. We ought to hold it more strongly in order that it may not be torn from us, until the day comes when we can place it in good hands, faithful to religion and to the throne of Spain, zealous and able to defend our glory.

The same writer goes on to specify in detail why the normal school should neither be abandoned to its fate nor turned over to another religious order.

It would be to the great glory of God, the salvation of souls, and the prosperity of the Spanish Crown in these Islands that it should continue under our care, for through this means we shall advance the welfare of the Islands, since well-trained teachers will be as apostles in their native villages.

We shall take our share in the spread of the Spanish language, whereby new truths may be implanted in the souls of the people.

We shall secure a place on the education board of Manila, which will be a great step toward advancement in the schools and will prevent certain troubles which may harm them.

We shall obtain an influence in the villages, and we shall win the sym-

<sup>17</sup> Father Luengo.

<sup>18</sup> See the document referred to in No. 27 of bibliography.

pathy of the people. Every schoolmaster who goes out will praise the Jesuits, for which reason many persons, especially their relations, will seek confession and discuss the affairs of the soul with the fathers of the society.

If the elementary schools are conducted by the third-year pupils of the normal school, an immense good may be done. If possible, the school should be situated in the outskirts of Manila. We should have far more children, and our administration would have an open field.

Of the influence of the schoolmaster among the children in the provinces, there can be no doubt, since they will be in accord with the teaching of the fathers and the rule of the society.

Let us suppose that we transfer our school to others. Who will take charge of it? Will they be religious? It is very doubtful. It is feared that, considering the ideas of the century and the tendency which has shown itself in Manila in various movements, instead of being religious men they will be laymen, and laymen trained in Spanish normal schools, who in their ignorance have spoken and still speak to the depreciation of the bishops, the parish priests, and family life.

Let us suppose that the school falls into the hands of some other religious order. Whoever they may be, I am doubtful if the normal school would be as productive as the government and the country expect. If they belong to the religious orders well known in this country, we have sufficient reason to distrust their ideas. With regard to education and the spread of Spanish, the normal school can show results in support of our arguments. Daily experience supports my contention—every day the attitude of the graduates toward religion is evident.

If the school falls into the hands of the religious men of the orders, we should be sorry for the results of their experience, as it is always essential to have a knowledge of the nature and habits of those to be educated, especially in the Philippines. It may be expected that before securing experience they will make such serious mistakes as will bring to ruin the plan of primary instruction in these Islands, which is one of the fairest jewels in the crown of the illustrious and venerable Father Cuevas. Let us look forward to the day when we can turn our attention from our parishes to the welfare of the normal school.

#### CONDITIONS CONFRONTING THE GRADUATES

A contemporary writer gives an admirable summary of the situation, indulging fully in his own opinions: <sup>19</sup>

After three years in the normal school, the prospective teacher comes fresh from his studies to don the toga of the schoolmaster. He goes to a village where he has secured a school. His youth and his inexperience do not augur success. If the parish priest lives in isolation from municipal affairs because of his character, his manner of life, and his belief that his intervention in teaching should be confined to certain definite lines, the poor teacher has recourse only to the petty governor who has no especial qualifications. It will be truly marvelous if he attains his end, introduces order into the school and obtains anything he needs, which is everything.

In a majority of the villages the people look with absolute indifference on the youth whose age is a slight recommendation, since knowledge and authority in Malay villages are conceded only to maturity.

<sup>19</sup> See No. 27 of the bibliography.

New teachers who have recently left the normal school should spend two or three years on probation, helping others who should be experienced and well known for their behavior to the village and the local and provincial inspectors. After this apprenticeship, the normal-school graduate would enter upon his duties with greater care.

There ought to be established, under the presidency of the parish priest, a board or committee composed of a certain number of resident parents chosen for their possession of property and by other qualifications to take their turn in looking after the school and giving the teacher moral support.

These municipal boards should assist the young teachers at the outset; should second the watchfulness of the local inspector; and, if they did their duty, they would render very difficult, if not impossible, the common fault that, where the parish priest fails in his duty of inspection, the teacher does as he wishes, and often behaves in a manner that is both reprehensible and impossible to correct.

As for textbooks, their absence is almost unbelievable. We can look for no remedy except on the part of the government; since they must be cheap, and cheapness can only be obtained by publishing large editions by contract and by distributing them wholesale through the provinces. Without textbooks, it is foolish to hope for the diffusion of Spanish.

#### WAS THE PURPOSE OF THE SCHOOL ACHIEVED

On this point let us hear the testimony of the director of the normal school in a letter to the director of civil administration dated May 31, 1889:

The normal school entered upon its academic career and always kept its purpose in mind until it could boast of having given the Archipelago over 1,100 teachers and assistants. As to the quality of the professional training which they have received, the normal school has vigorously complied with the government regulations, and has lately even done more by devoting more attention than the government prescribes to certain subjects. Its methods have never been unfavorably criticised, nor have any suggestions been modified. On any occasion where the government officials have honored the school with their presence, they have expressed themselves as thoroughly satisfied with its labors on behalf of education, as happened this year when Governor-General Weyler attended the commencement exercises.

Despite all this, there is a common complaint as to poor teachers and their inability to speak Spanish. While there is much exaggeration on this subject, due to the fact that modernism is always opposed to the religious atmosphere of the normal school, it must be recognized that many of the teachers are stupid and careless, that unless their minds are continually sharpened they grow rusty as they grow old, and that private affairs usurp the place of their studies and their professions.

But there are honorable exceptions. There are model teachers who carry out in full the plan of instruction authorized by the government. And all may reach this standard by strict inspection, continuous watchfulness, and the stimulus of rewards and punishments.

There is a general reason why there are only a few good Filipino teachers, but there are also many external causes which are partly excusable. The most important one is that every year about 50 graduates leave the school.

Of these, about a quarter secure positions as teachers, some go home satisfied with the education <sup>or</sup> already obtained, some look for clerical positions, some secure in a short time larger salaries with less work and responsibility than would befall them as teachers, while some go on with their studies to higher schools to secure a surveyor's or a commercial degree and thus rob the schools of the best educated teachers. These causes would cease if the pay of teachers were increased; they now receive less than other employees of much inferior education, although they have more work and greater responsibility.

Another reason why Filipino teachers are not careful in the performance of their duties is that they have little assistance. Some have no proper schoolhouses and no suitable equipment and accommodations, while others are confronted by the opposition of parents. Some spend most of their time in lowering the standards of their profession and are unable to keep up the position demanded of a teacher, until at last they possess little or nothing but the name. If then there are poor teachers, this affords no reason why the normal school should be characterized as useless.

We might make complaints on similar grounds to the effect that Spanish is little spoken. Fifty per cent of this criticism is exaggeration. Those who have spent some years in the country agree that in the last fifteen to twenty years they have noticed a remarkable increase in the number of those who speak Spanish in the provinces. To hope for universal Spanish is to disregard history and linguistics. The Basque and Catalan provinces of Spain, Alsace-Lorraine in Germany, and Roussillon in France are examples of the fact that, after a lapse of many centuries under a more advanced civilization and with more compulsion, primitive dialects have not been superseded by the official language. On this account, then, there is no charge against the normal school.

#### RECOLLECTIONS OF A GRADUATE

Don Mariano Padilla, who graduated from the normal school in 1888, furnishes the best description we have of the methods of teaching practiced in the training department of the normal school and in the public schools generally.<sup>20</sup>

The practice school, supervised by a graduate of the normal school, furnished the students an illustration of how to teach, as well as how to organize and manage a large school. Each pupil of the third year was required to attend this school two weeks before graduating. The method of teaching was also studied in the class. The pupil teachers were not only required to master the lessons and practical exercises assigned, but were also expected to be able to present and explain each subject in such a way that it could be understood by the children.

We studied four systems of teaching, which we called individual, simultaneous, mutual, and mixed. The individual system consisted in teaching pupils one by one all the lessons they studied. This system was not applicable to a large school, but for a few pupils it furnished excellent advantages as the teacher could instruct according to the capacity and intelligence of each.

<sup>20</sup> See No. 21 in the bibliography.

The simultaneous system consisted in dividing the school into classes or sections and teaching one after another of these. The size of sections depended upon the number of pupils in the school and the ability of the teacher to handle classes. This system was similar to that which is in operation in the public schools at the present time. The system had its advantages on account of the superior organization and supervision which it made possible, but in the time of the Spanish government the general adoption of this system was impossible on account of the scarcity of teachers. Owing to a lack of funds in the public treasury, there were seldom more than two teachers in a town, one male and the other female. As boys and girls did not attend the same schools, one teacher was compelled to give instruction in all classes and all subjects. In spite of the many advantages of this system, it was not then applicable to any considerable number of schools.

The mutual system consisted in selecting the more advanced pupils of the school and organizing them into groups of monitors, who were taught at different hours by the regular teacher. The instruction of the monitors included both subject matter and methods of teaching less advanced pupils. While the monitors taught the several sections, the teacher went about the room supervising the work of monitors, correcting errors, and keeping order in the school. In the larger schools, this was the most practical system then in vogue, but it was far from being perfect. As the teacher was often overcome with fatigue on account of his arduous duties, it was impossible for him properly to instruct the monitors.

The mixed system was a combination of the simultaneous and mutual system. The teacher divided the school into sections of 15 pupils each, grouping in the same section those pupils of equal knowledge. He then formed, from the most advanced section, two groups of monitors, called first and second monitors, whose instruction came direct from the teacher. One first monitor and one second monitor were assigned to teach each section by turns. The teacher divided his own time into three equal parts, one of which was devoted to the instruction of the first monitors, one to the second monitors, and the remainder was given to the general supervision of the school. The chief merit of this system lay in the fact that it combined direct supervision by the teacher with the aid rendered by monitors.

The training department of the normal school was organized under the mixed system. The pupils of the third year were compelled to attend this department for two weeks. Then the critic teacher in charge of the practice school submitted to the director of the normal school a report on the work of the student teacher, together with his opinion as to the ability of the student to direct a school.

The following may be said with reference to the movement of classes when the practice school was in operation. The ringing of the bell announced the beginning of the classes. At once the monitors, one first and one second, went to their respective sections. The teacher announced in a loud voice what subject was to be taught; for example, Spanish grammar. Upon the ringing of the second bell, the first monitors assembled in an appointed place to receive the instruction of the teacher. At the same time, the second monitors took charge of their respective sections. The time for teaching grammar having been finished, the teacher rang two bells, indicating a change in subjects. At once the whole school became

very quiet in order to hear what the teacher was about to announce. With the ringing of another bell, the first monitors took charge of sections and the second monitors went to their recitations. After the instruction of the monitors was completed, the teacher spent the remainder of his time in supervision.

#### THE NORMAL SCHOOL IS ELEVATED TO THE GRADE OF SUPERIOR

The fondness of the natives for instruction and the great increase in educational interest since the founding of the normal school led to the conclusion that the course of training offered teachers should be prolonged and improved. Accordingly, on November 10, 1893, the government of the Philippine Islands drew up a proposed decree elevating to the degree of "superior" the normal school for men teachers in Manila, and approving provisionally the new regulations for that school. On December 15 of the same year another decree was issued with orders supplementary to the superior decree and the regulations of the normal school, approved November 10. In April of the following year a royal order of the ministry of the colonies confirmed the decrees which elevated the normal school to the rank of "superior." That part of the decrees and regulations which in any way modified or extended previous decrees is in substance as follows: <sup>21</sup>

#### ORGANIZATION

Under the authority of the director, it is provided that there shall be at least six teachers, besides one instructor in drawing, one for vocal music, one for gymnastics, three assistants, and the number of servants and dependents necessary for the school. One of the teachers shall be spiritual instructor and have charge of the religious ceremonies; he shall also be instructor in sacred history and ethics. Another shall discharge the special duties of prefect of morals. The remaining instructors shall be occupied in teaching other subjects.

#### SUPPORT

The salaries to be received by the director, instructors, assistants, and dependents, as well as the expenses for equipment and the rent of a building, shall be paid out of the local funds of the Islands.

From a note furnished the director of civil administration by the director of the normal school in May, 1889, we obtain

<sup>21</sup> See No. 14 in the bibliography.

the following estimate of the annual expenses of the normal school:

	Pesos.
A director and 4 teachers	4,000
Three assistant priests	1,200
One teacher in drawing	600
Fifteen positions, pupils in school	1,800
Servants' and waiters' services	600
Materials for teaching	1,000
Rent of the normal school building	4,000
Materials for drawing classes	120
Total	13,320

The normal school continued to receive similar support until some years after the American occupation (page 166).

#### CURRICULUM

The course of study then included two grades, elementary and superior. The work necessary for obtaining a certificate as elementary teacher extended over a period of three years. Pupils of the normal school who completed the course prescribed for elementary teachers and passed all examinations with an average of "excellent" were entitled to become candidates for the degree of superior teacher. Those who did not obtain the mark of "excellent," but that of "good" or "fair," were entitled to receive a certificate as elementary teacher and to take charge of a school of a lower grade.

The course of study for elementary teachers was as follows:

Subject.	Recitation.		
	First year.	Second year.	Third year.
Religion and sacred history .....	Daily .....	Daily .....	Daily. Do.
Religion and morals .....	.....	.....	
Spanish grammar .....	Daily .....	Daily .....	Daily. Do.
Arithmetic .....	do .....	do .....	
Reading .....	do .....	do .....	Daily. Do.
Writing .....	Half hour daily .....	Half hour daily .....	
Music, drawing, and calisthenics .....	Daily .....	Daily .....	Half hour daily. Daily.
Manners and right conduct .....	Biweekly .....	Biweekly .....	
Geography .....	.....	Alternate days .....	Alternate days. Do.
History of Spain and the Philippines .....	.....	do .....	
Elementary geometry .....	.....	.....	Do. Do.
Pedagogy .....	.....	.....	
Elementary agriculture .....	.....	.....	Do.

The requirements for the degree of superior teacher were a general average mark of "excellent" in the course prescribed for elementary teachers and in addition thereto the following:



Advanced pedagogy, together with a knowledge of legislation in force regarding primary instruction in the Philippines; religion and ethics; universal history; algebra; industry and commerce; the ordinary phenomena of nature.

#### PENSIONERS

No tuition was charged, the school being supported by the government, but all boarders were required to pay for their maintenance. Among the latter class were the government pensioners. At one time there were 30 of these, but the number was reduced to 20, at a later date to 15, and finally the system was abolished altogether, as it was thought unnecessary. The allowance of pensioners was 10 pesos per month.

#### REGULATIONS

At the end of each month a review was given covering all the subject matter passed over during that month. A private examination was given on the work of each quarter, and a public final examination at the close of the year.

The holidays set aside for the normal school were the following: Sundays, Thursdays, feast days, Ash Wednesday, All Saints' Day, the birthdays of the Spanish sovereigns and of the Prince of Asturias, the day of the patron saint of the governor-general of the Philippine Islands, the Christmas holidays extending from Christmas Eve until January 2, and the Day of the Three Kings. The long vacation extended from the close of the examinations, about the last of March, until the first of June.

The merit of pupils was recompensed with honorable marks, which were entered in the book of the institution, and with annual prizes whose solemn distribution took place at the close of the final examinations.

The following internal regulations, governing the conduct of the pupils, were promulgated on November 24, 1893, and incorporated in these decrees:<sup>22</sup>

1. Every pupil was required to be:
  - (a) A native of the Spanish dominions.
  - (b) At least thirteen years of age.
  - (c) Free from contagious diseases and in good health.
  - (d) Able to speak Spanish, understand the Christian doctrine, read and write, and know something of arithmetic.
  - (e) Able to write to the director, giving his Christian name, surname, birthplace, and age.
  - (f) Vaccinated.

<sup>22</sup> See footnote 8.

2. The fees for all except government students were 140 pesos a year, payable in two installments—on the day of entrance and on the 1st of October. Ten pesos were paid as an entrance fee. For this, students received instruction in all classes, including ornamentation and the use of all scientific instruments and collections, as far as necessary.

3. Students were provided with iron bedsteads, beds, white bedclothes, washstand, and table linen. They were given the free use of the infirmary, dispensary, and the free services of the physician in cases of ordinary illness.

4. If a student left the school before the end of the year, he had the right to recover all that he had deposited, except for the unfinished part of the month in which he left. For absences or late registration, no more than a month's fee was deducted.

5. A prescribed uniform was required to be worn on certain days.<sup>23</sup>

6. Every three months a report as to conduct, application, and improvement in studies was sent to the parents.

7. A gentle and persuasive method of discipline was used, and every effort was made to impress upon the mind of the youth the sentiments of honor and noble rivalry.

8. Pupils were admitted only on the opening day, unless they justified their absence on serious grounds.

9. Pupils were permitted to receive visits from their parents or persons authorized by them, only once a week, and that during the recreation. In no case were they allowed to leave the school with friends or write or receive letters without the consent of the director.

10. Every pupil was required to speak Spanish, even in private conversation, and to write letters in Spanish only.

11. No student was allowed to possess money, but parents were permitted to leave with the director an amount not to exceed 30 pesos. From this fund, sons were granted a moderate weekly allowance to be spent on useful or healthful objects or given to the poor.

12. There were no vacations except at the end of the school year, when pupils were not allowed to remain longer in the school. No pupil was permitted to leave during the year except in the case of poor health.

In accordance with the superior decrees of December 15, 1893, the following regulations were set forth, prescribing the manner of holding written and oral examinations:

#### WRITTEN EXERCISES

1. The applicant will sharpen the pencils and prepare the pens.
2. He will write an alphabet of capital letters and another of small letters on ruled paper to be furnished him.
3. He will write from dictation a paragraph taken from a book.

<sup>23</sup> The following clothing was prescribed: Two pairs of white pantaloons, 2 pairs of colored pantaloons, 2 white jackets, 1 black alpaca coat, 2 black ribbons for the neck, 1 black cap, 2 pairs of shoes, 1 pair chinelas, 10 white shirts, 2 colored shirts, 12 handkerchiefs, 12 pairs of socks, 4 pairs of drawers, 1 mat, 1 pillow, 4 pillowcases, 4 sheets, 2 bed covers, the necessary toilet articles. (See Grifol's *La Instrucción Primaria en las Islas Filipinas*, page 20.)

4. He will solve problems in arithmetic that have been approved by the judges.

5. He will write a simple explanation of not less than half a sheet on his choice of three pedagogical subjects drawn by lot.

6. The applicant will work in full all problems submitted to him and leave all of the explanations on the paper to hand to the examiner. He must also explain the pedagogical point involved in the problem.

7. The examinations will continue for such a time as the judges may think fit, not to exceed two hours for writing and the solution of problems, one hour for the explanation of pedagogical points, and another hour for copying the work.

#### ORAL EXERCISES

1. Questions on some point of a subject drawn by lot, except pedagogy.

2. A reading exercise in printed letters and in handwriting.

3. A grammatical analysis of the words and sentences in a dictated paragraph.

4. A simple lesson demonstrating how some part of the work of the training school should be conducted.

The question or exercise upon which each student was expected to recite in the oral test was determined in the following manner:

The president of the board of examiners put into a box 50 balls, each bearing a number. The secretary drew out a ball in the presence of the applicant and read the number. The applicant was required to take the question or exercise of the corresponding number and give an answer at once. The judges listened to the recitation and gave the student a mark. The judges were also permitted to ask suitable questions. The oral examinations did not continue more than half an hour.

#### TEACHERS' EXAMINATIONS

It was provided that examinations be held four times each year for the benefit of those who desired certificates as assistants. The examinations were conducted by the director and the teachers of the normal school.

The general division of civil administration was empowered to issue teachers' certificates upon the recommendation of the director of the normal school.

When there was a vacancy in any of the better positions of the teaching service, the place was filled by competitive examination: any one who had a certificate as elementary teacher was eligible to enter the contest. In case of a tie in the examination ratings obtained, consideration was given to the teacher of most experience or to the one who had the best record in the practice school.

## THE NORMAL SCHOOL BOOTH AT THE EXPOSITION

The Philippine Territorial Exposition was held in Manila in 1895. At this exposition was an exhibit by the Superior Normal School. It is interesting to note the contrast between that exhibit and those which are given at the present day by the public schools at the Philippine Carnival.

In the center of the hall was a large booth surmounted by the sign of the normal school. On the right-hand side hung 12 geographical and statistical maps, showing the condition of public instruction in the Philippines. All of the villages in which there were schools were shown, even the number of grades in the various schools being given. These maps were drawn by the pupils of the normal school under the direction of their teachers. On the left side were the plans of the building of the Superior Normal School and the observatory of Manila. On each side were photographs of the pupils in their holiday, Friday, and ordinary uniforms. There were photographs of the various rooms in the building, including the chapels of the fathers and the students, the dining room, the study hall, the upper classrooms, the baths, the garden, the basin, and the gallery.

Below these plans were carefully colored maps of Spain and the Philippines, surrounded by a collection of trophies and prizes and by beautiful copy-book pages, the whole forming an artistic and intricate pattern on a bright green ground, surmounted by the normal-school shield. This was drawn by the boys in the practice school.

In the center of the normal-school booth was a table with drawers, and on its sides two pyramid-shaped stands on which were placed the following agricultural implements in miniature: A spade, a shovel, a hoe, a rake, a pick, a trowel, a mattock, a hatchet, various instruments for cutting, a harrow, a combination pickaxe and hammer, a Coleman cultivator, a Scott cultivator, a foot ruler, a Crasskill ruler, a Bochin seeder, a lawn mower, a hay mower, a riddle, a Bochin straw cutter, a Bochin weeder, a modern thrasher, a plow, a two-pronged fork, a small grape vat, a coconut vat, a grape squeezer, a well, and a hydraulic chain pump.

In the central cabinet were the following: Different prizes given in the Normal School, consisting of medals, diplomas, and recitation rewards; the Regulations in Force, as applied in the schedule of the course for superior teachers; the Elements of Pedagogy, by Father Jose Murgadas; the three volumes of

Spanish grammar lately published by Father Santiago Mazo; Yove's Sacred History, in three parts; Carderara's Industry and Commerce, dedicated to the normal school. This cabinet also contained the work of several provincial teachers, including pedagogical and literary articles, and maps and charts of various kinds.<sup>24</sup>

#### THE PEDAGOGICAL ACADEMY

The pedagogical academy was an association of teachers for the study of educational questions and the betterment of the teaching profession. The academy was founded by the director of the Superior Normal School on February 23, 1894. The organic regulations according to which the academy was to be governed were approved by the governor-general on July 20, 1894. These were in substance as follows:

1. The academy proposes to cultivate the pedagogical studies among the teachers of the Philippines, to promote a love for these, and to devise suitable means for their development.

2. The board of directors shall be composed of the director of the normal school as president, the dean of the academic classes as vice-president, two councilors to be chosen by the president and vice-president, and a secretary to be elected by the board.

3. There shall be three classes in the academy. The first class shall be the superior teachers; the second class, the elementary teachers; and the third class, the assistant and the substitute teachers.

4. In order to be admitted to the academy, it is required that: (a) An application addressed to the board shall be filed with the president; (b) the credentials of the applicant, together with a statement regarding his profession or business, shall be submitted; (c) the applicant shall possess a good name and an exemplary character.

5. Teachers living in the provinces may become members in the same manner as others.

6. The members of the academy will meet fortnightly in the normal school, at an hour previously appointed, for a literary performance. The meetings will continue for two hours, and the following will be the order of business: (a) Call to order; (b) reading of minutes of the last meeting; (c) the subject to be discussed will be proposed by the president, and some member named by him will talk on the point indicated. In lieu of this, a lecture of not more than thirty minutes' duration will be given by a member of the society; (d) remarks by the chairman; (e) adjournment.

On October 1, 1894, the governing board of the academy held its inaugural session in the normal school. At this meeting a librarian and a director of the pedagogical museum were elected.

We can better understand the purpose of this association

<sup>24</sup> Boletín Oficial de Magisterio Filipino, 1, 34.

and more fully appreciate the work which it accomplished by examining the following excerpt from a report of the secretary. This report included a general review of the work of the academy during the first two years of its existence.

The director of the Superior Normal School, cognizant of the necessity of providing some means by which the teachers who graduate from the normal school may develop, proposed the establishment of a pedagogical academy. This association was the means of impressing upon the teachers the dignity and honor of their profession, inspiring them with the desire to spread morality and culture among their pupils, to carry intelligence from province to province and from town to town, to awaken the families to the call of necessity knocking at their doors, and to enkindle in the minds of the common people the sentiments of virtue, knowledge, patriotism, and Christianity; as these things insure more and more the moral and material enlargement of the Archipelago.

Enough has been said to convince one of the utility and great importance of the pedagogical academy. It is filling a want which has been felt throughout the history of these Islands, and is destined to remedy many of the faults of the teaching profession.

In corroboration of what I have just said, let us take a look into the past. Not long ago, the schools of the Archipelago were rated as woefully deficient. This condition of affairs resulted from a lack of schoolhouses and equipment, a lack of interior organization, poor attendance, the inexperience of the teachers, and the want of pedagogical knowledge. It is not my purpose to censure the Spanish Government nor reprove the teachers, but, with my hand upon my heart, I am constrained to lament the fact that in spite of the ardent fondness and powerful means put forth by the government of His Majesty and the diligence of those in charge of education in this distant region the results up to date cannot be compared with those achieved elsewhere in the same time and with the same labor.

The academy tends to dissipate these difficulties. At first the effect may be small, but it will become constantly greater as the fight goes on against those things which restrain or annul teaching.

The academy has already given palpable proof of its vitality and usefulness in disentangling the difficulties that are opposing the instruction and education of the Filipino youth. Evident proof of this truth lies in the good results reported by the teachers who took part in the literary sessions held periodically in the academy. In these meetings, they acquired useful knowledge which was entirely new. Even the teachers in the provinces who did not attend the sessions were benefited by those meetings, accounts of which were published in the Official Bulletin for Filipino Teachers.

Our academy has other effective means of instruction. These are the pedagogical library and the museum which the academy has been forming little by little from the beginning, in order to refresh and enrich the knowledge of the teachers.<sup>25</sup>

The following may further serve to show the character of the work undertaken by the pedagogical academy.

<sup>25</sup> See No. 5 in the bibliography.

## THE FIRST PEDAGOGICAL CONTEST IN THE PHILIPPINES

This contest was instituted by the Pedagogical Academy, through its president, the director of the Superior Normal School, for the purpose of stimulating interest in matters educational. The zest and enthusiasm with which the contestants and the audience entered into the occasion show unmistakable signs of an educational awakening. The range of subjects discussed and the manner of treatment are not without significance. Incidentally, the occasion was representative of the rather striking type of literary entertainments which characterized the Spanish schools of that day and is still common in the better private schools of the Islands.

This contest was held on December 3, 1895, exactly thirty years after San Francisco Xavier was declared patron of the normal school. We cannot do better than let the chronicler of the time tell the story of the pedagogical contest in his own way.<sup>26</sup>

The occasion was solemnly begun, and it took place in the chapel of the Superior Normal School for teachers, the hall eloquent in its simple, but fitting decoration. The top of the stage was protected by a curtain artistically painted for the occasion. Under this artistic dais was placed a presidential table which was occupied by the judges of the contest. Sitting near this table was the honorary president, his excellency, the governor-general of these Islands; on his right, the archbishop of the diocese; and, on the left, the major-general of the naval squadron. On both sides, the seats in the first row were occupied by the director-general of civil administration, the president of the royal audiencia, and the fiscal and the governor-general of Manila. The other seats were occupied by a numerous and select audience.

A symphony executed with great precision opened the meeting. Then followed a short opening address by the chairman of the judges of the contest. The speech may be summed up as follows: The exordium consisted in declaring the solemnity, importance, scope, and transcendency of pedagogical contests, emphasizing the fact that this, the first to be celebrated in the Philippines, opened a new era and should be marked with golden characters in the annals of primary education in the Islands.

The subject matter of the address was the following: The Greatness of the Profession of the Primary Teachers, in which two principal arguments were discussed and which formed the body of the address. These two arguments were: The origin of the profession of teaching and the object of the same. In the second argument was considered, in meaning words, the good that it gives to individuals, as well as to the family and the community as a whole. On the other hand were explained the evils that confront not only the vicious teacher, but also the teacher who is negligent in the performance of his duties.

<sup>26</sup> This account is an abridgement of that which appears in *Boletín Oficial de Magisterio Filipino*, 2, No. 1. See No. 23 of the bibliography.

The peroration of the speech contained an expression of gratitude to his excellency, the governor-general, to the metropolitan archbishop, to the director-general of civil administration, to the superior of the Company of Jesus, and to the director of the Superior Normal School, for their protection and patronage of the first pedagogical contest held in the Philippines and for the prizes which they had offered to the winners of the five themes. The speaker also thanked the teachers, who had rendered their services to make the contest a success, praising those who were awarded prizes, giving them his good wishes, and encouraging those who were less fortunate, so that in future contests they may also wear the wreath of victory.

This was followed by the reading of a paper, containing the result of the work done and the prizes obtained. The gist of the paper read was as follows: Five compositions were awarded prizes for excellence, 28 others were rated as "good," while 7 were rejected because the writers did not observe the instructions. The paper whose subject was To the Progress of the Philippines was unanimously considered by the judges as the best, and therefore received first honors.

After the secretary had read the subject of this composition, the sealed envelope containing the paper was brought on a silver plate to his excellency, the governor-general, who announced the name of the author, Don Catalino Sevilla, a teacher, by merit, of the first municipal school of Binondo. The author having declined to read his paper, his emotions preventing him from doing so, the task was undertaken by Señor Baldosano, whose excellent reading helped to emphasize the beautiful thoughts of the composition. Immediately after the reading, Señor Sevilla was called to the front to receive from the hands of his excellency, the governor-general, the prize offered by his excellency. It consisted of the works of Señor Benor in three volumes, *Arquitectura de las Lenguas*. The volumes were elegantly bound in Russian leather; on the obverse was a monogram of the name of Jesus, inlaid with silver; in the center was inscribed, in plated letters, First Pedagogical Contest. Just below this was inlaid in silver the arms of the city of Manila. On the back of each of the three volumes was the silver inscription, First Prize, and in the lower part were the silver initials of the governor-general, with the crown of a marquis.

In this paper, the writer expressed his sorrow at the scarcity of children attending schools in most of the towns of the Philippines, and gave three causes for this sad misfortune, with the corresponding remedies.

1. *Lack of schoolhouses, materials, and furniture.*—He proposed a remedy to the effect that the municipalities should work out a plan for the building of schoolhouses. He treated this point with practical wisdom, praising all, without laying blame on anybody.

2. *Internal organization of the schools.*—He prescribed moderate treatment. He divided the schools into three classes which might be subdivided indefinitely, according to the number of children, and he also presented the program of study for each of the sections. He insisted that a teacher should prepare the lesson before going to the class and that his explanations should be made simple in order to reach the understanding of the pupils. He recommended the method of teaching by object lessons. He treated of reward and punishment of pupils, citing opinions to substantiate his statements and alluding to the fact that the Eternal Judge rewards the good and punishes the bad. He concluded this argument by saying that prizes are not sufficient to gain the love and good will of the pupils. He condemned



those teachers who cannot be respected by the pupils without resorting to harsh punishment.

3. *Administrative acts of local authorities.*—He said that these should be efficient and continuous, and finished his essay by quoting the words of Governors Izquierdo and La Torre.

After this, the secretary proceeded to the consideration of the essays for the second theme whose subject was *A Treatise Concerning the Teaching of Spanish in the Philippines*. The envelope in which it was inclosed was opened by the archbishop of Manila, and the author was found to be Don Mariano Leuterio, superior teacher and secretary of the Pedagogical Academy.

He divided his essay into three parts: Importance of the wide extension of the Spanish language in all parts of the Philippine Archipelago; legislative acts conducive to this end; and comments on the Spanish language, showing the difference between language and grammar.

1. The author began with the statement that language is to the nation as a mother is to her child, the home to the family, and society to the individual. He went on to prove that the most effective means to spread education, agriculture, industry, and commerce in the Philippines is through the diffusion of the Spanish language everywhere.

2. This paragraph showed that the author had fathomed the depths of legislation.

3. This paragraph marked the line between the study of the language and the study of grammar and the methods to be pursued for the acquisition of both.

After the reading, Don Mariano Leuterio was called to receive his prize from his excellency, the prelate. It consisted of a magnificent geographical, statistical, and historical dictionary of Spain and its domains. He received an ovation from the audience as he took his seat, after receiving the prize.

The third theme was *A Brief Treatise Concerning the Duties of Teachers in the Philippine Islands*. The prize was obtained by Don Pedro Serrano. Sr. Baldosano read a part of this composition, which was greatly applauded by the audience. The giver of the prize, Señor Bores, himself delivered the prize, which was an elegantly bound edition of Monlau's *Rhetoric and Poetry*.

There were no papers presented for the fourth theme, and the prize, offered by the superior of the Company of Jesus, was awarded to the essay that got second place in the first theme, whose author was found to be Don Florencio L. Gonzales, vice president of the academy, superior teacher, and director of the College of the Immaculate Conception. The author read a part of this essay, which was greatly applauded by the audience. The prize, consisting of the works of Donosa Cortes, in four volumes, was awarded by the governor-general.

The secretary then passed to the fifth theme, *Discourse on Teaching by the Object Method*. Padre Isidoro de la Torre opened the envelope, and the superior teacher and proprietor of the school in Quiapo, Don Pedro Serrano, received the prize, consisting of a book, *Heterodoxos Españoles*, by Don Marcelino Menendez Pelayo, from the hands of the governor-general.

After the reading of the records of the secretary was finished, the contest was concluded by a hymn sung by the students of the Superior Normal School. The press of Manila eulogized the great success of the first pedagogical contest; the director of the Superior Normal School, who had origi-

nated the contest; the Pedagogical Academy; and all the teachers who contributed to this intellectual competition.

We cannot close this short description of the pedagogical contest without quoting the words of *El Comercio*, which show the quality of our modest celebration: We consider this contest of such importance, that we thought to devote a special edition to it, thinking that the celebration of yesterday, by its influence upon the culture and advancement of the Filipinos, in all spheres of moral development, and the stimulus it gives to public education, deserves more attention than the limited applause of a mere local and passing comment.

\* \* \* \* \*

And although the contest of yesterday has yet to show the public the practical application of the varied activities discussed in the various essays, yet the knowledge that there exist energy and talent among those most concerned in primary education in these Islands, as shown in the recent contest, namely, among bright young pedagogues, merits the decided help and protection of the government and of the public in general; and these circumstances are sufficient to make us dedicate our pen to the contest. It was indeed a great lesson that was taught yesterday at the Superior Normal School for teachers, which was not perhaps realized by all. As the sound that it produced in the atmosphere echoes and reëchoes to unknown limits, as a stone that falls on the surface of a lake causes the waters to move in concentric circles away from it, until they reach the very shore of the lake itself, so will the celebration of yesterday extend its undying influence over every locality in the Archipelago. It will encourage the unpretentious teacher in some dark corner of these Islands to carry on with greater efforts his educational work and to live up to the heights of his noble profession; and as his extraordinary talents and activities are placed before the eyes of the public and receive its applause, his individual efforts will be more and more encouraged, and will thus contribute greatly to the welfare of his country. May God, in His infinite kindness, make this first pedagogical contest in the Philippine Islands the beginning of a new era of progress for the education of the Filipino youth.

#### THE NORMAL SCHOOL UNDER THE AMERICAN FLAG

##### A STATEMENT TO THE PATRONS OF THE SCHOOL

Soon after Spanish sovereignty came to an end in the Philippine Islands, the following circular letter was issued by the authorities of the normal school:

This center of education, well known to the Filipino people as it now is in the thirty-third year of its existence, has trained thousands of young men for every province in the Archipelago, and still remains open to all those who desire to avail themselves of its advantages.

The few fathers of the society, who conduct the school, will be obliged in the future, as in the past, to give its pupils a sound, moral, and religious education, so that they may fulfill the desires of the Filipino people, who are Catholic and intend to remain so; and second the aims of the United States Government in bringing about the welfare of the country.

Teaching will be given in Spanish, the only language in general use in

the Archipelago, and indispensable now and for a considerable period in the future. For this reason, three courses in Spanish are compulsory.

Three courses with a daily recitation in each will also be given in English, since English has not only come to be of great value, but a knowledge and use of this language are always necessary.

As a study of these two languages is somewhat difficult, it must occupy a greater part of the time of pupils, to the reduction of other courses which may be less important. These are preparatory courses essential to the primary and secondary teacher.

The degrees conferred by the school have such a value that they will be recognized by the American Government, and in any case will be sufficient proof that the pupil is ready for any position.<sup>27</sup>

In 1899, Father Pedro Torra, giving evidence before the Philippine Commission regarding the educational conditions in the Islands, furnished the following interesting statement concerning the normal school and its graduates, which is given in abstract:<sup>28</sup>

In order to be a teacher in an official school, a degree as master from the normal school was exacted, but at times when there were no such persons holding degrees substitutes were appointed, and only at such times.

Of those who have graduated from the normal school some have died. Others have never cared to teach, having pursued the course only to learn Spanish and get a general education. If they had all desired to teach, there would have been no scarcity of teachers. The career of teacher is an arduous one, involving a great deal of hard work, and they do not care to undertake it. The salary which would be sufficient in an ordinary walk of life is not sufficient for a teacher. It does not compensate him for the amount of hard work he has to do to fit himself for his profession. Those who have actually taken up their profession have done it either because they have been encouraged to do so by the fathers, or as a simple matter of honor. If it had not been for the fathers, hardly any of them would have put their learning into practice. Then, too, it must be remembered that in the towns there were other things which would bring them much more remuneration than they would receive as teachers. For instance, they could serve as interpreters for the petty governors, which, without the hard work involved in exercising their profession, would bring them a very much higher return. The way to induce them to exercise their profession would be to give them better compensation, more privileges, and make the profession more attractive for them.

Teaching was obligatory only for those to whom the government paid a pension. These were required to teach for a period of ten years.

The school has no connection with the United States Government, except that the latter has continued to pay us the amount the Spanish Government gave us, and the courses are continuing. The amount of the endowment is 8,880 pesos a year; but in consideration of the fact that the necessities of life are a great deal more expensive now than formerly, an increase of this amount has been asked for through the inspector of schools. An increase

<sup>27</sup> Copy in the Ateneo, Manila.

<sup>28</sup> Report of the Philippine Commission (1900), 2, 285.

equivalent to one-third of the present amount is necessary for the continuance of the establishment.

The following year, a complete prospectus was issued, showing the degrees offered by the school and the conditions necessary to obtain these degrees, the entrance requirements of pupils, the length of terms, and supplementary classes, and giving an account of the practice classes, methods of discipline, terms and accommodation offered to boarders, requirements in dress, and the course of study.

The course of study as revised at the opening of the school year in 1900 was as follows:<sup>29</sup>

## FIRST YEAR

Spanish language	Recitation daily.
English language	Recitation daily.
Arithmetic	Recitation daily.
United States, general, and Philippine geography	Recitations on alternate days.
Catechism and sacred history	Recitations on alternate days.
Writing	Half an hour daily.

## SECOND YEAR

Spanish language	Recitation daily.
English language	Recitation daily.
Arithmetic and elementary algebra	Recitation daily.
United States and Philippine history	Recitations on alternate days.
Explanation of the catechism	Recitations on alternate days.
Writing	Half an hour daily.

## THIRD YEAR

Spanish	Recitation daily.
English	Recitation daily.
Elementary geometry and surveying	Recitation daily.
Elementary pedagogy	Recitation daily.
Elementary agriculture	Recitation daily.
Religion and morals	Recitations on alternate days.
Lectures on politeness	Weekly.

The study of Spanish and English comprised all the grammar, suitable exercises in reading, writing from dictation, analysis, translation, composition, and speech making.

The requirement for candidates for the degree of superior teacher was the possession of the degree of elementary teacher with a rating of "excellent" and in addition the following:

- Advanced pedagogy.
- Elements of physics, chemistry, and natural history.
- Studies and literary exercises in Spanish and in English.
- A study of certain religious, moral, and ethical questions of value.

<sup>29</sup> The prospectus mentioned in No. 25 of the bibliography.

## ELECTIVES

Vocal and instrumental music.  
Drawing of every kind.  
Hygienic gymnastics.  
Meteorology and seismology.  
General principles of fine arts.

In sending out the above-mentioned prospectus, Father Torra inclosed the following circular letter:

The change that is taking place in the social and religious life of the Philippines makes every day more necessary the maintenance and multiplication of Catholic teaching centers of all kinds and grades, which may deserve particular confidence. On the other hand, the attitude of the Government of the United States on the subject of education in this country is unknown. We cannot tell how they will regard institutions that have not been established by the Government, and are therefore unofficial, or what value they will attach to the degrees won in these institutions, and what requirements they will exact in the future.

The Jesuit fathers, who claim by the help of God to have done some little good in the Islands, through the sound instruction and Christian education which they have given for many years in the Superior Normal School, are anxious to continue at work, if this is for the good of the country. They hope that the Government will recognize the value of their work. Up to the present, the great majority of those who have obtained the degree of schoolmaster in the normal school have used their education both to teach and to obtain dignified positions.

This being so, I am sending you the inclosed prospectus, in order that, if you think fit, you may show it to all parents of your acquaintance, whom you think may be interested, because the more pupils the normal school obtains, the more consideration it will secure: it will be able to interest the Government and the general public of these Islands, and more thoroughly diffuse the Catholic faith.

## A STATEMENT TO THE PHILIPPINE COMMISSION

In September, 1900, the director of the Superior Normal School addressed to the Philippine Commission the following exposition:

The object of this establishment is the creating of suitable teachers to fill the position of schoolmaster in the public schools throughout the Philippine Archipelago. It was founded by the Spanish Government and inaugurated on the 23d of January, 1865.

The course covered three years, and included all those subjects usually taught in the primary schools. In 1893, an extra course was added to amplify the knowledge of the teachers and equip them for giving superior primary instruction. By virtue of this improvement, the school was raised to the category of a superior normal school. Since the last course was completed, the study of the English language has been added in all classes, including those in the school of practice. This school of youth is associated with the normal school, and in it the future masters are exercised in the practice of teaching.

The Spanish Government appropriately subsidized this school, and paid the expenses of the material and furniture, and therefore the teaching was, and still remains, entirely gratuitous. At the close of the Spanish dominion in these Islands, the Government of the United States continued to give this subsidy, and even made it somewhat larger, up to a little more than a year ago.

The average number of pupils when conditions are normal is:

In the course for the degree of master	450-500
In the school of practice	150-200
Total	<u>600-700</u>

The present number of pupils is:

In the course of the degree of master	304
In the school of practice	201
Total	<u>505</u>

The total number of masters up to the present is	1,606
Annual average	53
Total number of assistants	340

Some of the above-mentioned pupils are boarders, and their number has varied according to the capacities of the various buildings which the normal school has successively occupied. In 1896, the boarders numbered 184; at the present time there are 102. The unpeaceful state of the times in many provinces of the Archipelago has been the reason that more pupils have not entered.

The school being without suitable quarters, the Company of the Jesuits erected in Ermita the building now occupied by the normal school. For this undertaking, it was necessary for the mission to burden itself with a considerable debt which it hoped to extinguish in a few years by the help of the 4,000 pesos' loan which the Spanish Government offered it, and the economies it would be able to make. As it stands now, the structure has cost more than 200,000 pesos and at the present could not be erected at three times the cost. Therefore, we do not believe that we exceeded the bounds of justice when we asked last year of the Government of General Otis an increase of appropriation. Nevertheless our petition was rejected.

The increase of the endowment has become more necessary on account of the notable increase in price which articles of actual necessity have reached. Without claiming, then, any right by the sacrifice mentioned or the merits of our teaching, the writer limits himself to submitting to the consideration and wisdom of the Commission the necessity in which the normal school finds itself for an increase in endowment, in order that with more ease and better results it may continue its work in the future.

Besides this, in order that this institution may retain its reputed importance and show a reason for existence, it is necessary that it should acquire a special title for the granting of degrees to teachers. This has not been done in the last two years.

It is necessary in the same way to recompense the masters well and to stimulate their zeal by all possible inducements, otherwise the last of

them will withdraw from the occupation of teaching to seek more gain in other employments or business which call for much less work and subjection.

The undersigned in the name of the corporation which he represents asks, moreover, that if he inspires the Commission with sufficient confidence in his corporation it will vouchsafe to leave it entire liberty in the election of the teaching staff, texts, and methods of teaching, and above all in the teaching and practice of the Catholic religion in the same way as this liberty is understood and practiced in the Catholic colleges of the United States.

Finally, as it is of the utmost importance to the teaching institutions represented by me to know as soon as possible and with all possible certainty for future guidance and determination what is to be the future lot of this normal school, I ask the Commission to have the kindness to manifest to me, with loyalty and frankness, its feeling and wishes regarding the above-mentioned points and any other which may at the time affect the well-being and prosperity of this establishment.

#### THE CREATION OF THE DEPARTMENT OF PUBLIC INSTRUCTION

The Commission did not grant the foregoing petition. On January 21, 1901, the Philippine Commission enacted the law creating the Department of Public Instruction. This Act placed all public schools under the immediate charge of the Director of Education. Some of the duties assigned this official were the general supervision of the entire Bureau, the fixing of a curriculum for all public schools, the prescribing of the attainments necessary for teachers, the appointment of teachers, and the fixing of a definite salary for each. The Act further provides that no teacher or other person shall teach or criticize the doctrine of any church, religious sect, or denomination, or shall attempt to influence the pupils for or against any church or religious sect in any public school.<sup>30</sup>

In contemplation of the foregoing Act, the reasons for declining the petition of Father Torra are obvious. While his request was in perfect accord with the practices of the Spanish Government, an institution endowed by the Government and managed wholly as a private enterprise, without any direction or supervision by the Government, is very unusual under the American flag.

#### A REQUEST FOR AUTHORITY TO CONTINUE THE NORMAL SCHOOL

On March 18, 1901, Father Torra wrote Brig. Gen. George W. Davis, provost-marshal of Manila, as follows:

I have the honor to inform you that the school called the Superior Normal School for Schoolmasters is about to be incorporated by law, but in the meanwhile, according to the president of the Philippine Commission, it

<sup>30</sup> Act 74 of the Philippine Commission.

requires authorization to continue in the work of teaching. The name of the school up to the present has been the Superior Normal School for Schoolmasters and in the future will be known by this name.

I hope, sir, that you will be kind enough to grant written authority for the continuation of this school on the same conditions as during the last two years.

The following reply to the foregoing communication was submitted by Dr. David P. Barrows, at that time city superintendent of schools for Manila:

This institution, although belonging to and under the direction of a religious order, was established by the Spanish Government as a factor in its system of instruction, all salaries and expenses being paid from the public funds. This arrangement continued after the American occupation by a verbal order of the military governor authorizing the payment to this institution and to the Ateneo of 1,145 pesos every month for the salaries of the teachers and 187.17 pesos for rent of the buildings used by the said religious order. The normal school was also furnished material for its classes through this department.

By a recent resolution of the Philippine Commission, this institution ought not to receive any aid from the public funds after the present month. This school will not henceforth form part of the public-school system, but will be on the same footing as any other private school. In section 25 of the law establishing the Department of Public Instruction we read: "There shall be nothing in this law to prevent, hinder, or stop the formation and continuation of private schools in these Islands." It appears that written authority is not necessary for the continuation of this institution as a private school, but there seems to be no reason why it shall not be given.

#### THE WITHDRAWAL OF FINANCIAL SUPPORT AND FINAL CLOSING OF THE NORMAL SCHOOL

On March 30, 1901, Maj. Gen. Arthur McArthur promulgated an order authorizing the Superior Normal School to continue its work as a private institution, but withholding further financial assistance.

Owing to the unsettled times incident to the war, the increase in the cost of living, the withdrawal of financial support, the discarding of Spanish as the language of the schools, and the change in the sovereignty of the Islands, the normal school was never able to get fairly upon its feet after the American occupation. However, it remained open and continued to turn out small classes of graduates until 1905, when its doors were finally closed after a useful career of forty years.<sup>31</sup>

<sup>31</sup> The present Philippine Normal School is in no way an outgrowth of the Spanish Normal School for Men Teachers. For several years the two institutions were located on adjoining campuses, but each managed its own affairs and sent forth its graduates entirely independent of the other.



## GRADUATES OF THE NORMAL SCHOOL FROM 1866 TO 1905

	Graduates.		Graduates.
1866	14	1887	46
1867	25	1888	59
1868	27	1889	50
1869 <sup>32</sup>	0	1890	39
1870	29	1891	40
1871	39	1892	46
1872	54	1893	51
1873	53	1894	111
1874	65	1895	32
1875	79	1896	39
1876	120	1897	26
1877	78	1898	26
1878	81	1899 <sup>33</sup>	0
1879	66	1900	10
1880	55	1901	12
1881	51	1902	20
1882	50	1903	19
1883	29	1904	25
1884	33	1905	11
1885	34		
1886	49	Total	1,693

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<sup>32</sup> During the first few years of the history of the normal school, the annual sessions closed in December; but in 1869 the time of closing was changed from December until the following April; hence the lack of graduates for 1869.

<sup>33</sup> In 1899 no one took the examination on account of the war which was then in progress.

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11. Datos facilitados al Exmo. Sor. Director de Admon. Civil por el R. P. Director de la Escuela Normal a fines de Mayo de 1889.—MS. in the Ateneo.
12. El Seminario y Escuela Normal de San Xavier a María Imaculada en el quincuagésimo aniversario de su Definición Dogmática (1904).—MS. in the Ateneo.
13. Estados de la Escuela Normal.—A series of tables and outlines, giving statistical and other information. In the Ateneo.
14. GRIFOL, DANIEL. La Instrucción Primaria en las Islas Filipinas.—A collection of school laws from 1863 to 1894. Manila, 1894. In the Philippine Library, the Ateneo, and the Central Seminary of San Francisco Xavier.
15. Historia de la Escuela Normal de Manila (1865-1872).—MS. in the Ateneo.
16. Index of Examinations for the Degree of Teacher (1865-1905).—A book in the Central Seminary of San Francisco Xavier.
17. Instrucción Primaria. Clippings from the Diario de Manila, September 19 and 20 (1883).—In the Ateneo.
18. Instrucción Primaria.—Clippings from La Oceanía Española, September 18 and 20 (1880). In the Ateneo.
19. LUENGO, FRANCISCO G. MARTIN. A letter to Father Juan Ricart, written from Surigao, January 25 (1881). In the Ateneo.
20. Official Register, giving a digest of decrees, correspondence, and other information relating to the Normal School. A book in the Central Seminary of San Francisco Xavier.
21. PADILLA, MARIANO. San Carlos, Pangasinan, graduated 1888. A MS. prepared by Mr. Padilla. It is in the possession of the author. Facsimiles of diplomas appear in the appendix.
22. Párrafo sobre las Escuelas Normales.—A general discussion on secular normal schools. MS. in the Ateneo.
23. Primer Certamen Pedagógico de Filipinas. This is a book of about 100 pages comprising the proceedings and essays presented in the first pedagogical contest. The book is No. 1 of volume 2 of the Boletín Oficial de Magisterio Filipino. In the Ateneo.
24. Proyecto de Plan de Instrucción Primaria y de Establecimiento de una Escuela Normal de Maestros en Manila redactado por la Junta nombrada al efecto en 1855, y Presentado al Gobernador General en 7 de Marzo de 1861 seguido del voto particular del vocal P. Gainza, Dominico, sobre Escuelas en idioma Castellano, al cual se opone.—MS. in the Ateneo.

25. Prospectos y Reglamentos de la Escuela Normal de Manila (1900–1901).—In the Ateneo.
26. Reglamento Interior de la Escuela Normal.—MS. in the Ateneo.
27. Relación de la Fundación, Régimen Interior, Desarrollo y Frutos de la Escuela Normal de Maestros escrita en 1887.—MS. in the Ateneo.
28. Report of the Philippine Commission, 1900. Government Printing Office, Washington (1900).
29. Education in the Philippines. Report of the United States Commissioner of Education, 1902. Government Printing Office, Washington (1903), 2.
30. Ricart, Father Juan. A letter written to the Director of Civil Administration, October 1, 1883, regarding the destruction of the normal school building. In the Ateneo.
31. Reyes, Francisco. Comunicación al Gobernador General por el Presidente de la Comisión de Estudios.—MS. in the Ateneo.
32. Varios Proyectos de Planes de Estudios Redactados por las Comisiones Nombrados al Efecto. Manila (1856–1866).—MSS. in the Ateneo.



## ILLUSTRATIONS

PLATES I and II. Certificates issued by the Spanish normal school.

III and IV. Indorsements on certificates issued by the Spanish normal school.





**EL DIRECTOR GENERAL DE ADMINISTRACION CIVIL  
DE LAS ISLAS FILIPINAS**

[illegible]

FOR TAVIN, con arreglo al artículo 37 del Reglamento de 20 de Diciembre de 1863 y en uso de las facultades que me confiere el Superior Decreto de 9 de Setiembre de 1879, he repuesto en vigor para que pueda desempeñar una escuela pública de TERNERO DE ANAYA CLASE, abanderado de las letras, ciencias, humanidades y naturales, con sujeción al Real Decreto y Reglamento expedidos en la citada fecha de 20 de Diciembre de 1863, y en sus disposiciones por el Sr. D. Juan de la Cruz, en 29 de Mayo de 1879.

De este modo, se demuestran mejor en la Contaduría de estas rentas, en la Escuela Normal de maestros, y el Agrupado de este Estado, sin cuyo requisito no está admitido; y especialmente se consignaron a continuación de él por disposición del Jefe de la provincia, las fechas de los mandamientos expedidos a este efecto en sus días, el subscrito con fundamento de este Decreto central.

Estado de Veracruz de Querétaro de mil ochocientos noventa y tres

80. Lea del La Decena del 30

**Ed Directed Research,**

21 July 1964, Regencia,

*Marquis de Sade*

George D. Smith.

Estado de manutención preliminar de la categoría de primera clase expedido a favor de Mariaa Lavilla.





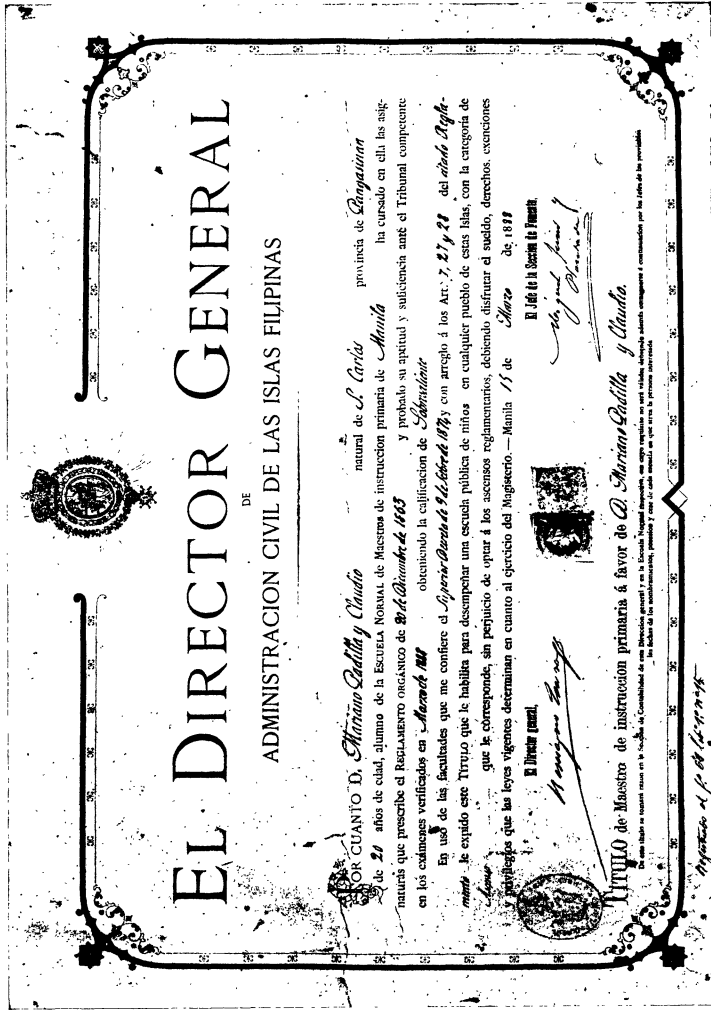


PLATE II. CERTIFICATE ISSUED BY THE SPANISH NORMAL SCHOOL.



## Escuela Normal de Varones

Se tomó rason al folio 22 libro 12  
a 18 de Marzo de 1838

*John W. Smith*

Donnerstag den 18. Sept. 1893

Nel settembre io giro capo al S. bound  
 al mare di Okhotsk (Chart 6600)  
 secondo un avvisamento S. S. bound  
 al S. E. Mackay. S. alla provincia  
 S. inteso. S. non ripassano S. S.  
 Direzione generale del 12 de Mayo del 1899

11110 obra en sus antecedentes, en este folio  
diciembre del 25 de Marzo del 1900



-Ed. Johnson - Los Angeles  
 H. J. P. - Los Angeles, California

PLATE III. INDORSEMENT ON CERTIFICATE.







## NEUE HOMOPTEREN VON DEN PHILIPPINEN

Von L. MELICHAR

(Brünn, Moravia, Austria)

Ein Tafel

### DIETYOPHORINÆ

*Orthopagus* (Udugama, *Anagnia*) *philippinus* sp. nov. (Taf. I, Fig. 1 u. 2.)

Scheitel doppelt so lang wie zwischen den Augen breit, zwischen den vorderen Augenecken eingeschnürt, die Seitenränder geschärft und aufgerichtet, die Oberfläche zwischen den Augen zu einem kleinen schwarzen starkglänzenden Knopfe erhoben, welcher mit dem ebenso kallösen glänzenden schwarzen Höcker der Scheitelspitze zusammenhängt. Eine ebensolche schwarze runde Schwiele befindet sich an der Basis der Stirne am Ende des Mittelkies, während die Seitenkiele an der Aussenseite von einer Reihe von schwarzen Makeln begleitet, sich oberhalb der Schwiele mit einander verbinden. Die Seitenkiele der langen Stirne konvergieren nach unten und reichen bis zur Clypeusnaht. Der Clypeus in der Mitte und an den Seiten gekielt, die untere Hälfte dunkelbraun, das Labrum an der Basis hellgelb; auf der Clypeusnaht 4 kleine dunkle Pünktchen die inneren einander genähert, die äusseren am Rande. In der oberen Wangenecke (zur Scheitelspitze) 3 schwarze Punkte, der 3. dicht am Rande, je eine kleine Makel vor der Ocelle, der Fühlergrube und am unteren Wangenrande. Pronotum halb so lang wie der Scheitel, hinten stark stumpfwinkelig ausgeschnitten, im Winkel selbst deutlich eingekerbt, auf der Scheibe mit 2 eingestochenen Punkten, zwischen denselben ein starker hellgelber Längskiel. Schildchen mit 3 Längskielen, der Mittelkiel stark, und wie die Schildchenspitze hellgelb. Die Flügeldecken hyalin, glashell, glänzend, mit gelblich braunen Adern, einer breiten halbmondförmigen Längsbinde am inneren Apikalrande ohne hyaline Randflecken, in welcher die Quernerven hellgelblich sind, und eine das Stigma nach innen überragende Längsmakel in der Mitte des Costalrandes. Stigma vierzellig. Auf den Seiten der braunen Vorderbrust eine helle breite schräge Binde. Der Bauch unregelmässig braun gefleckt. Die Vordersehenkel an der Unterkante erweitert, die Erweiterung vor der

Spitze zahnförmig abgesetzt, dunkel gefleckt und gebändert, die Schienen an der Basis und Spitze und zwei Ringe in der Mitte braun. Hinterschienen mit 6 schwarzen Dornen, an der Basis derselben schräge schwarze Striche. Vordertarsen und die Spitzen der hinteren Tarsenglieder braun.

Länge sammt Flügeldecken 12.5 mm. (♂, ♀).

LUZON, Los Baños, Mt. Maquiling (C. F. Baker).

Fünf Exemplare erhalten.

#### CIXIINÆ

##### *Dystheatias punctata* sp. nov.

Schmutzig zitronengelb oder rostgelb, mit schwarzen Punkten auf den Flügeldecken.

Scheitel quer viereckig, die Augen nicht überragend, der Hinterrand gerade, auf dem Scheitelrande 2 flache Eindrücke. Stirne zum Clypeus verbreitert, in der Mitte ein deutlicher Längskiel, welcher sich auf den Clypeus fortsetzt. Ocellen klein, die 3. Ocelle nicht vorhanden, Fühler kurz. Pronotum vorne gerade, den Hinterrand des Scheitels berührend, hinten winkelig ausgeschnitten. Schildchen von den Seiten zusammengedrückt, oben flach mit 3 parallelen Längskielen, von welchen der Mittelkiel besonders eleviert erscheint. Flügeldecken stark vertikal gestellt, nach hinten allmählig verbreitert, hinten schief nach vorne gerundet. Das Geäder mit feinen farblosen Körnchen ohne Härchen besetzt. Der äussere und innere Sektor ist im ersten Drittel des Coriums gegabelt, der mittlere Sektor einfach. Auf der Teilungsstelle der Clavusader, ein schwarzer Punkt, in der Mitte des Coriums 2 solche in einer Querlinie stehende Punkte, zuweilen treten noch am Costalrande 2 bräunliche Pünktchen auf; am Apicalrande an den Spitzen der Apicaladern schwarze Punkte. Flügel hyalin, nicht getrübt, die Unterseite und Beine blass gelblich, zuweilen grünlichgelb.

Länge 4–4.5 mm. (♂, ♀).

LUZON, Los Baños (C. F. Baker).

##### *Dystheatias fuscovenosa* sp. nov.

In der Form und Struktur der vorhergehenden Art gleich, nur sind die Sektoren rostbraun und mit ebensolchen Körnchen besetzt, das Geäder im Apicalteile ist mit der Grundfarbe (blass gelblich) gleich. Am Apikalrande dunkle Randpunkte.

Länge 4.5 mm. (♀).

LUZON, Los Baños (C. F. Baker).

Die Gattung *Dystheatias* Kirk. steht den Gattungen *Kirbyana*



Melich. und *Ptoleria* Stål sehr nahe. *Kirbyana* unterscheidet sich durch den winkelig ausgeschnittenen Vorderrand, *Ptoleria* durch den in der Mitte des Coriums gegabelten mittleren Sektor der Flügeldecken von *Dystheatias*.

Genus **BENNARIA** novum

Scheitel sehr schmal, stark reduziert, als schmaler nach hinten abfallender quer viereckiger Raum wahrnehmbar, so dass von oben der grösste Teil der Stirne sichtbar ist. Die Stirne von der Seite betrachtet gerundet, lang und schmal, die Ränder geschärft und aufgerichtet, die Stirnfläche glatt, ohne Mittelkiel. Clypeus kurz, in der Mitte und seitlich gekielt, an der Clypeusnaht die 3. Ocelle deutlich sichtbar. Rostrum dünn, bis zur Mitte des Hinterleibes reichend. Fühler kurz. Pronotum sehr schmal, hinten breit winkelig ausgeschnitten. Schildchen so breit wie lang, mit 3 parallelen Längskielen. Flügeldecken an der Basis schmal, nach hinten verbreitert, hinten quer gestutzt, mit abgerundeten Ecken. Verlauf der Adern wie bei *Benna* Walk. An den Seiten der Brust ein nach aussen vorstehendes stielartiges Organ, welches an der Spitze becherartig erweitert und mit weissem Sekret bedeckt ist (wie bei *Benna*). Flügel hyalin. Beine mässig lang, Hinterschienen ohne Dornen.

Von der Gattung *Benna* Walk. insbesondere durch die nicht gekielte Stirne zu unterscheiden.

Typ. gen.: *Bennaria bimacula* sp. nov.

*Bennaria bimacula* sp. nov. (Taf. I, Fig. 3.)

Braun, die Kiele des Schildchens schwarz. Flügeldecken gelblich braun, mit einer grossen runden schwarzen Makel auf der Teilungsstelle des inneren Sektors. Das Geäder und die Costalrandader schwärzlich. Im Apikalteile 3 bogenförmige aus braunen Makeln zusammengesetzte Querbinden. Flügel rauchbraun, mit schwarzen Adern. Hinterleib dunkelbraun. Beine bräunlichgelb.

Länge 8 mm.

LUZON, Los Baños (*C. F. Baker*).

*Ugyops granulatus* sp. nov.

Gelblichbraun. Scheitel klein, trapezoidal, die Basis der Stirne von oben sichtbar, auf welcher die beiden Stirnkieläste in die Ecken des Scheitels einmünden. Stirne sehr lang, oben schmal, zum Clypeus etwas wenig verbreitert und dann wieder verengt. Die Ränder fein gekielt. In der Mitte der Stirn ein Längskiel

welcher sich im unteren Drittel gabelig teilt, die Gabeläste, dicht neben einander eine schmale Spalte bildend, münden in die vorderen Scheitelecken. Clypeus halb so lang wie die Stirne, in der Mitte und an den Seiten gekielt. Die Fühler lang, den Kopf weit überragend, das 1. und 2. Fühlerglied fast gleich lang, die Fühlerborste kurz. Pronotum etwas wenig länger als der Scheitel, vorne gerade gestutzt, hinten sehr schwach gebuchtet, fast gerade, oben mit 3 Kielen und 2 eingestochenen Punkten. Schildchen so breit wie lang, mit 3 Längskielen. Die Flügeldecken schmal, lang, 4 mal so lang wie einzeln breit, nach hinten nicht verbreitert, hinten einfach gerundet. Der äussere Sektor in der Mitte des Coriums gegabelt, der äussere Gabelast vor der Queraderlinie nochmals geteilt, der 2. Sektor einfach, der 3. Sektor hinter der Mitte geteilt. Aus der Queraderlinie entspringen 9 Apikaladern, von denen die 3. (von aussen) gegabelt ist. Die Apicalzellen sind sehr lang und schmal, der Apikalrand hat einen fein quergestrichelten Saum. Im Clavus eine Gabelader, deren Schaft in den Schlussrand mündet. Die ganze Coriumfläche ist mit feinen Körnchen besetzt, die auch zu beiden Seiten der Sektoren liegen. Die rauchbraune Apikalmembrane ist nicht gekörnt, nur die Apikaladern fein granuliert, so dass sie bei schiefem Lichte wie angenagt erscheinen. Flügel rauchbraun. Unterseite und Beine blass gelblich, die nicht besonders langen Hinterschienen mit 3 Dornen.

Länge 6 mm. (♀).

LUZON, Los Baños (C. F. Baker).

#### ACHILINÆ

#### Genus *TANGINA* Melichar

*Tangina* MELICHAR, Hom. Fauna Ceylon (1903), 44.

*Eurynomeus* KIRK, Bull. Haw. Sugar Pl. Assoc. (1906), 1, 422.

#### *Tangina quadripunctulata* sp. nov.

Blassgelb, die Unterseite heller. Auf der Scheitelspitze 2 schwarze Punkte, und auf dem Schildchen jederseits ausserhalb der Seitenkiele ein grosser schwarzer Punkt. Die Augen grau, am unteren vorderen Rande derselben eine schwarze Makel. Die Stirne ist etwas gewölbt, mit starkem Mittelkiel, die Ränder fein gekielt. Flügeldecken hyalin blassgelb, der äussere Sektor ist vor der Mitte des Coriums gegabelt, beide Gabeläste am Ende bogenförmig in die Costa einmündend. (Auf. Taf. II, Fig. 19b, *Tangina bipunctata* Mel. ist die Gabelung des 1. Sek-

tors nicht eingezeichnet.) Hinterschienen mit einem Dorn vor der Mitte.

Länge 3.5 mm.

LUZON, Los Baños (*C. F. Baker*).

*Tangina quadrilineata* sp. nov.

Scheitel quadratisch, nach unten geneigt, die Augen nicht überragend, in der Mitte fein gekielt. Die Stirne wie bei *T. bipunctata* Melich. gebildet, mit einem Mittelkiel, welcher sich auf den Clypeus fortsetzt. Kopf und Pronotum gelblichweiss. Schildchen gelb mit 2 schwarzen Punkten und zwar befindet sich jederseits ein Punkt in der vom äusseren Kiele und dem Schildchenrande gebildeten Ecke. Ein grosser schwarzer Punkt auf den Seiten der Vorderbrust. Flügeldecken hyalin, milchweiss, an der Basis mehr gelblich, mit 2 scharfen schwarzen Längsstreifen, der äussere Streifen befindet sich auf dem ersten Sektor und dem inneren Gabelaste derselben, der zweite nimmt den Schlussrand ein. Apicalmembrane übereinander geschlagen, rauchbraun. Flügel hyalin, milchig getrübt. Die Unterseite und Beine gelblichweiss. Hinterschienen mit einem kleinen Dorn vor der Mitte.

Länge 4 mm. (♂, ♀).

LUZON, Los Baños (*C. F. Baker*).

*Majella philippina* sp. nov.

Der Scheitel die Augen überragend, schmal, nach vorne verschmälert, die Seitenränder blattartig erweitert und aufgerichtet mit den gleichfalls blattartigen Rändern der Stirne in eine stumpfe Ecke zusammenstossend. In der Mitte der Scheitelfläche ein feiner Längskiel. Der Scheitel sowie die blattartigen Ränder derselben und der Stirne weiss, vor den Augen an den Seiten des Kopfes 3 schwarze Striche. Die Stirne dreieckig, oben einen scharfen Winkel bildend, nach unten verbreitert, die Seiten abgerundet, die Fläche schwarzbraun, mit einer weissen dreieckigen Makel in der oberen Stirnecke. Clypeus kurz, braun. Augen schwarz, Fühler kurz, gelblich. Pronotum sehr schmal, der Vorderrand zwischen den Augen bis zur Mitte derselben vorgeschoben, dunkel gefleckt, Pronotum so lang wie breit, mit 3 parallelen Längskielen, die Oberfläche schwarz und braun gefleckt, die hintere Partie zwischen den Seitenkielen einschliesslich, diese und die Schildchenspitze weiss, dasselbst 2 dunkle Punkte zwischen den Kielen und 2 braune Stricheln vor der Spitze. An diese weisse Makel schliesst sich ein schwarzer Längsstrich, der auf dem Mittelkiele liegt.

Flügeldecken länglich, hinten stark abschüssig, wie gebrochen, und übereinander geschlagen, braun, an der Costalseite mit roten Körnchen, auf den dunklen Adern mit weissen Körnchen dicht besetzt. Im Clavus am Schildchenrande ist ein kleiner hyaliner Fleck mit schwarzem Punkte auf der weissen Clavusader. In der rauchbraunen am Apikalrande schmal rot gesäumten Apikalmembrane sind die Apikaladern und Queradern weisslich, mit schwarzen Pünktchen besetzt. Am Stigma ein schwarzer glänzender Punkt mit rotem Hofe in Form eines Auges. Flügel rauchbraun, Unterseite schwarz, die Beine braun, die Schenkel schwärzlich, Hinterschienen mit einem kleinen Dorne in der Mitte.

Diese Art ist der australischen *M. majella* Kirk. ähnlich, doch nach der sehr kurzen Beschreibung Kirkaldy's lässt sich die Identität nicht feststellen.

Länge 3.5 mm.

LUZON, Los Baños (*C. F. Baker*).

*Callinesia philippina* sp. nov.

Gelblichbraun mit braunen Flecken gezeichnet. Scheitel etwas wenig länger als an der Basis breit, vorne gerundet, flach, die Seiten fein gekielt, auf der Scheitelspitze beiderseits des durchlaufenden Mittelkieses ein schwarzer Längsstrich. Stirne ziemlich breit, nach oben deutlich aber nicht stark verschmälert, in der Mitte gekielt, die Ränder fein gekielt und zum Clypeus gerundet. Die Stirne gelblichbraun, der Clypeus dunkler. Das Gesicht ist stark horizontal geneigt, der Scheitel nach unten abschüssig. Ocellen gross, rot, Fühler globulös. Pronotum halb so lang wie der Scheitel, vorne gebogen, hinten gebuchtet, in der Mitte gekielt, Schildchen hellgelb mit 3 hellen Längskielen, zwischen denselben vorne und hinten und an den Seiten braun gefleckt, Flügeldecken hyalin, mit zahlreichen braunen Flecken, welche 2 nach vorne und innen schräg laufende Binden bilden, am Costalrande mehrere schräge Striche und ein schwarzer Punkt an der Basis der 2. Apikalzelle. Die Apikalmembrane rauchbraun. Die Unterseite dunkelbraun, die Beine schmutzig gelblichbraun.

Länge 4.25 mm.

LUZON, Los Baños (*C. F. Baker*).

Zu dieser Gattung gehört: *C. fimbriolata* Melich., Hom. Fauna Ceylon, s. 47 (*Paratangia*).

*Nysia alba* sp. nov.

Etwas wenig grösser und breiter als *N. atrovenosa* Leth. Crémeweiss, bloss das Schildchen blass gelb. Der Scheitelkiel

parallel, geschärft und aufgerichtet in die ebenso geschärften Seitenränder der Stirne bogenförmig (Seitenansicht) übergehend. Die Stirne parallel, zwischen die Augen sehr unbedeutend verschmälert, in der Mitte nicht gekielt. Clypeus klein dreieckig, gewölbt, an den Seiten gekielt. Fühler kurz, gelblich. Pronotum sehr schmal. Schildchen gewölbt, mit einem deutlichen Längskiel in der Mitte. Flügeldecken milchweiss, opak, mit weissen Adern, der äussere Sektor an der Innenseite, die äussere Clavusader auf beiden Seiten gekörnt. Verlauf der Adern wie bei *N. atrovenosa*. Sechs Apikalnerven, der 2. und 3. von aussen gerechnet gegabelt. Flügel hyalin, milchweiss. Hinterleibsrücken schwärzlich. Die Unterseite und Beine blass gelblichweiss. An der Hinterleibsspitze beim ♀ häufig weisses flockiges Sekret.

Länge 6 mm., Breite 1.5 mm. (♂, ♀).

LUZON, Los Baños (*C. F. Baker*).

*Lamenia flavescens* sp. nov.

Kopf, Pronotum und Schildchen rotgelb, Flügeldecken hyalin, schwach gelblichbraun tingiert. Augen schwarz. Der Scheitel ist quer viereckig. Die längliche Stirne in der Mitte nicht gekielt, die Seitenränder geschärft. Augen verhältnismässig sehr klein, schwarz. Unter den Fühlern eine deutliche lamellenartige Querleiste. Das Geäder der Flügeldecken dunkler, Flügel graulichbraun, mit dunklen Adern. Der Mittelkiel des stark gewölbten Schildchens ist stark, die Seitenkiele kaum angedeutet. Vor der Schildchenspitze eine tiefe Querfurche. Beine blassgelb.

Länge 4 mm.

LUZON, Los Baños (*C. F. Baker*).

RICANIINÆ

*Pochazia marginalis* sp. nov. (Taf. I, Fig. 4.)

Pechschwarz, matt. Stirne schwarz, in der Mitte mit einem feinen Längskiel versehen. Clypeus schwarz. Pronotum in der Mitte gekielt, mit 2 eingestochenen Punkten. Schildchen mit 3 Kielen, die inneren Gabeläste der Seitenkielen mit dem Mittelkiel vorne verbunden. Flügeldecken breit dreieckig, der Costalrand vor der Apicalspitze flach eingebuchtet, der Marginalrand konvex. Die Flügeldecken schwarz, ein länglicher Randfleck hinter der Mitte des Costalrandes und der ganze Marginalrand weiss hyalin. Die Costalrandader rostgelblich. Flügel rauch braun. Die Unterseite schwarz, Beine bräunlichgelb.

Länge 13 mm.; Spannweite 24 mm.

LUZON, Mt. Maquilang (*C. F. Baker*).

**Pochazina bakeri** sp. nov. (Taf. I, Fig. 5.)

Der *P. handlirschi* Melich. ähnlich, die Stirne, Unterseite und Beine lehmgelb, die Oberseite braun, die Flügeldecken mit grünlichem Schimmer auf der Diskalfläche und kupferartig glänzenden Impressionen am Costal- und Marginalrande. Hinter der Mitte der Costa nur ein schmutzig gelblicher hyaliner Keilfleck, in den Apikalecken und längs des Marginalrandes 3 kleine hyaline Punkte.

Länge 13 mm.; Spannweite 24 mm.

LUZON, Los Baños (*C. F. Baker*).

## TAFELERKLARUNG

### TAFEL I

- FIG. 1. *Orthopagus philippinus* sp. nov. Kopf und Thorax von oben gesehen.  
2. *Orthopagus philippinus* sp. nov. Kopf von vorn.  
3. *Bennaria bimacula* gen. et sp. nov.  
4. *Pochazia marginalis* sp. nov.  
5. *Pochazina bakeri* sp. nov.





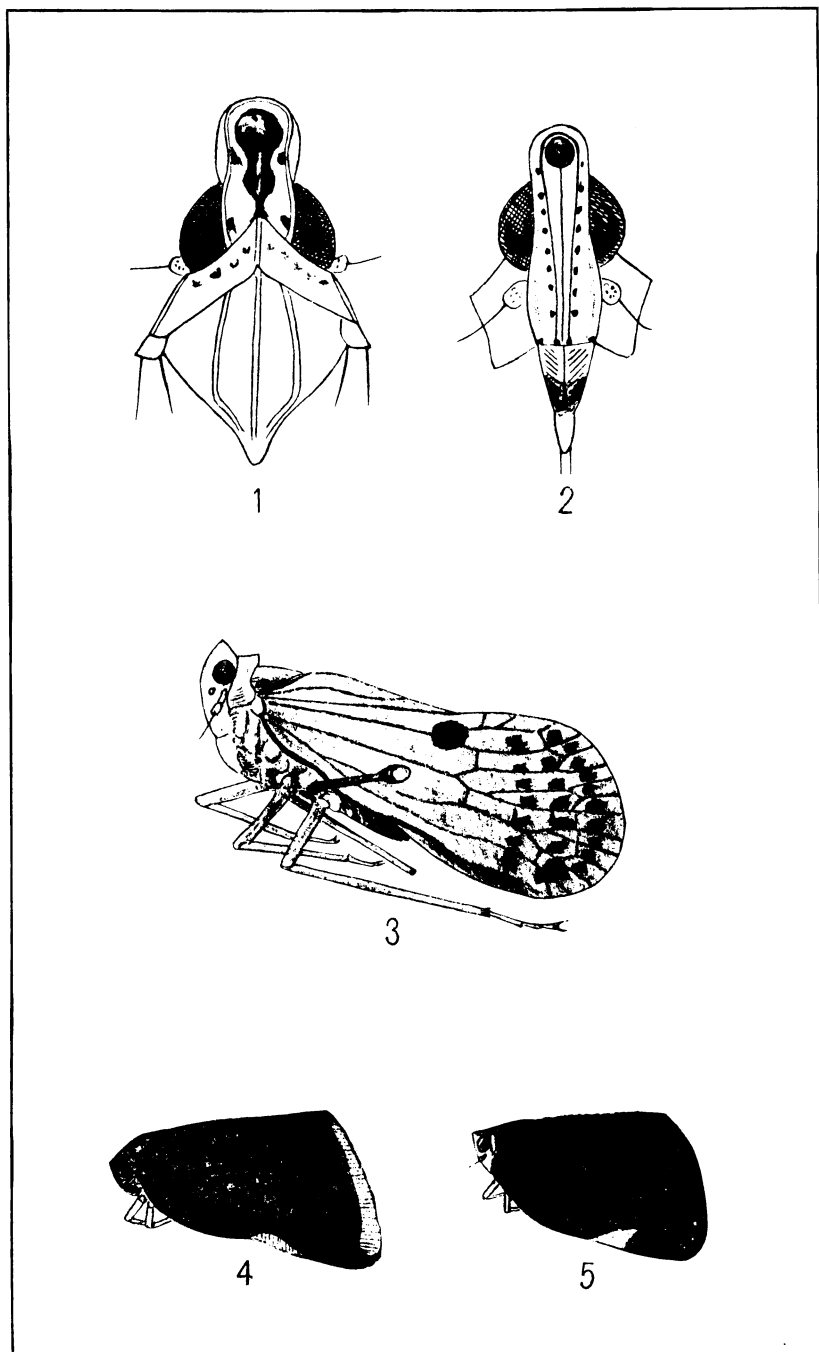


Fig. 1. *Orthopagus philippinus* sp. nov. Kopf und Thorax von oben gesehen. 2. *Orthopagus philippinus* sp. nov. Kopf von vorn. 3. *Bennaria bimacula* gen. et sp. nov. 4. *Pochazia marginalis* sp. nov. 5. *Pochazia bakeri* sp. nov.



## NOUVEAUX CYNIPIDES DES PHILIPPINES

Par J. J. KIEFFER

(Bitsch, Germany)

### 1. EUCÆLINÆ

#### Genus **PROMIOMÆRA** Ashmead

Ashmead a donné une courte diagnose du genre *Promiomæra*, mais il n'a pas décrit l'espèce typique et jusqu'à présent on ne connaissait aucune espèce qui put s'y rapporter. Même l'espèce que nous allons décrire ne concorde pas entièrement avec la diagnose établie par Ashmead, les antennes n'étant pas filiformes, comme chez l'espèce observée par Ashmead, mais en massue.

#### *Promiomæra rufithorax* sp. nov. (♀.)

Noir, lisse et brillant; thorax d'un roux clair, antennes, hanches et pattes jaunes, massue antennaire noire. Les antennes se composent de 11 articles, dont les deux premiers sont gros, le 2<sup>e</sup> globuleux, 3-5 très minces, graduellement raccourcis, le 3<sup>e</sup> deux fois aussi long que gros, les 6 suivants subitement grossis, un peu plus longs que gros, le dernier en ovoïde. Thorax aussi haut que long; sillons parapsidaux nuls. Scutellum à fossettes petites, cupule médiocre. Ailes ciliées, stigmatique droite, trois fois aussi longue que la 3<sup>e</sup> partie de la sous-costale, un peu plus courte que le radius, cellule radiale un peu plus longue que large, ouverte à la marge dans sa moitié distale, aréole nulle. Abdomen avec une ceinture rousse à sa base, un peu comprimé, allongé, aussi long que le reste du corps.

Taille: 1 mm.

Localité: LUZON, Laguna, Los Baños (C. F. Baker).

#### Genus **SCHIZOSEMA** Kieffer

#### *Schizosema cellularis* sp. nov. (♂.)

D'un roux marron; vertex noir, antennes et pattes d'un roux clair. Front convexe, lisse et brillant comme tout le corps. Antennes composées de 14 articles et non de 15 comme d'ordinaire, articles 3-14 subcylindriques, un peu plus longs que gros, subégaux; 3<sup>e</sup> article non excavé ni grossi. Thorax pas plus long que haut, sillons parapsidaux nuls. Scutellum avec une impression transversale en avant, sans fossettes, cupule petite, élevée. Ailes longues, ciliées, échancrées en arrière de l'extrémité alaire,

nervures pâles, cellule radiale ouverte à la marge, exactement semicirculaire, cubitus oblitéré dans sa 1<sup>er</sup> partie, bien marqué et percurrent dans la 2<sup>e</sup>. Abdomen sans ceinture à sa base, à peine comprimé, plus long que le thorax, moitié antérieure plus sombre que le thorax, moitié postérieure plus claire que le thorax.

Taille: 1.2 mm.

Localité: LUZON, Laguna, Mont Maquiling (*C. F. Baker*).

#### Genus COTHONASPIS Hartig

*Cothonaspis* (*Hexaplasta*) *minima* sp. nov. (♀.)

Noir, lisse et brillant; articles antennaires 3-7 roussâtres, pattes d'un blanc brunâtre. Antennes de 13 articles, dont les 6 derniers sont subitement grossis, deux fois aussi gros que les précédents, presque deux fois aussi longs que gros, subcylindriques et munis de quatre arêtes percurrentes et dépassant un peu leur extrémité, 13<sup>e</sup> article ellipsoïdal, 3-8 beaucoup plus minces que les deux premiers, subcylindriques et serrés, le 3<sup>e</sup> deux fois aussi long que gros, le 4<sup>e</sup> un peu plus long que gros, 5-7 pas plus longs que gros. Thorax très convexe, subglobuleux. Sillons parapsidaux nuls. Fossettes du scutellum petites, cupule assez grande, elliptique, avec un point enfoncé en avant et un autre en arrière. Ailes hyalines, longuement ciliées, nervures brunes, cellule radiale triangulaire, ouverte à la marge dans les deux tiers distaux, un peu plus longue que large, 3<sup>e</sup> partie de la sous-costale ponctiforme, radius un peu plus long que la stigmatique, cubitus oblitéré dans sa 1<sup>er</sup> partie, percurrent et bien marqué dans la seconde. Abdomen comprimé, un peu plus long que le thorax, ceinture étroite.

Taille: 0.8 mm.

Localité: LUZON, Laguna, Los Baños (*C. F. Baker*).

#### Genus EUCELIDEA Ashmead

*Eucelidea* *maquilingensis* sp. nov. (♀.)

Noir, lisse et brillant; mandibules, hanches et pattes d'un roux jaune. Tête transversale vue d'en haut, triangulaire et plus haute que large vue de devant. Yeux allongés et glabres, reliés à la bouche par un sillon oblique. Joues égalant les deux tiers de la longueur des yeux. Antennes de 13 articles, dont le 2<sup>e</sup> est globuleux, 3-13 filiformes, pubescents, graduellement raccourcis, le 3<sup>e</sup> presque trois fois aussi long que gros, plus mince que les autres, le 12<sup>e</sup> un peu plus long que gros, un peu plus court que le 13<sup>e</sup>. Thorax aussi haut que long, très convexe.

Pronotum profondément découpé en arrière. Mesonotum pas plus long que large, sillons parapsidaux percurrents, profonds, réunis un peu avant le bord postérieur, vers le  $\frac{1}{5}$  postérieur, en une arête qui atteint le bord. Scutellum sans fossettes en avant, tout le dessus étant occupé par la cupule qui est elliptique et creusée en ellipse, surface postérieure perpendiculaire. Ailes hyalines, dépassant beaucoup l'abdomen, brièvement ciliées, nervures brunes, cellule radiale pointue, fermée, deux fois et demie aussi longue que large, 3<sup>e</sup> partie de la sous-costale et stigmatique très obliques, la stigmatique de moitié plus longue que la 3<sup>e</sup> partie de la sous-costale, radius deux fois et demie aussi long que la stigmatique, aréole nulle, cubitus évanoui en avant, percurrent dans sa 2<sup>e</sup> partie. Pétiole aussi long que gros; abdomen très comprimé, ayant sa plus grande hauteur en arrière, ceinture nulle.

Taille: 1.8–2 mm.

Localité: LUZON, Laguna, Los Baños et Mont Maquiling (C. F. Baker).

## II. LIOPTERONINÆ

### Genus *ALLOCYNIPS* novum

♂. Tête vue de devant trapézoïdale, vue de dessus très transversale. Yeux gros, allongés, glabres, touchant le bord occipital, d'un tiers plus longs que les joues. Vertex avec deux arêtes qui vont du côté externe de chaque scape jusqu'au bord occipital, un espace triangulaire et relevé, bordé par une arête, va en s'élargissant depuis les antennes jusqu'au bord occipital, où il renferme les ocelles disposés en triangle. Palpes maxillaires de 5 articles, les labiaux de 3. Antennes filiformes, situées un peu avant le milieu des yeux, presque deux fois plus distantes de la bouche que du bord occipital, composées de 14 articles. Thorax deux fois aussi long que haut, peu convexe. Pronotum découpé en angle postérieurement, son milieu presque ponctiforme et portant une spinule courte et verticale, les lobes atteignent les écailles. Mesonotum allongé, pointu en avant, sillons parapsidaux percurrents. Scutellum allongé, graduellement aminci en arrière, presque horizontal, avec deux fossettes en avant. Metathorax en cône horizontal et court, terminé par un anneau auquel s'insère le pétiole, comme chez *Aulacinus*. Ailes pubescentes, cubitus ayant son origine au-dessus du milieu de la basale, cellule cubitale unique et fermée, cellule radiale fermée aussi au bord alaire. Tous les tarses plus longs que les tibias, dépourvus d'appendices, pattes posté-

rieures grossies, crochets tarsaux simples. Pétiole aussi long que gros, inséré au-dessus des hanches postérieures, abdomen aussi long que le thorax, graduellement grossi en arrière où il est obtus, non comprimé, 2<sup>e</sup> tergite à peine plus long que le 3<sup>e</sup>, non liguliforme quoique ses côtés soient graduellement rétrécis, 3<sup>e</sup> et 4<sup>e</sup> subégaux, 5<sup>e</sup> à peine plus court que le 4<sup>e</sup>, égal au 6<sup>e</sup>, tous deux déclives, 7<sup>e</sup> perpendiculaire et semicirculaire, les 3 derniers grossièrement sculptés. Le type est *Allocynips ruficeps* sp. nov.

*Allocynips ruficeps* sp. nov. (♂.)

Noir, lisse et brillant. Tête d'un roux clair, avec une ponctuation grosse et dense. Palpes rouges. Antennes à peine plus courtes que le corps, d'un noir brillant, scape le plus gros, de moitié plus long que gros, 2<sup>e</sup> article presque transversal, 3<sup>e</sup> égalant les 2 premiers réunis, deux fois aussi long que gros, 4-14 graduellement amincis, trois à quatre fois aussi long que gros. Prothorax d'un roux clair, lobes du pronotum à points gros, ombiliqués et denses. Mesonotum traversé par des arêtes transversales et assez denses, sillons parapsidaux profonds, divergents fortement en avant. Scutellum réticulé, à cellules ombiliquées, les deux fossettes grandes et séparées seulement par une arête. Metathorax mat, grossièrement ridé, pubescent de blanc. Ailes antérieures enfumées, cellule sous-costale, médiane et sous-médiane presque hyalines, cellule radiale et cubitale et une bande le long du bord en arrière de la cellule radiale d'un brun noir, cellule cubitale étroite, deux fois aussi longue que large, cellule radiale de moitié plus longue que la cubitale, trois fois aussi longue que large, 2<sup>e</sup> partie du radius double de la 1<sup>e</sup>, 3<sup>e</sup> triple de la 2<sup>e</sup>, presque droite, cubitus percurrent. Ailes inférieures enfumées dans leur moitié distale, avec 3 crochets fréniaux et la nervation ordinaire des Cynipides. Pattes antérieures et intermédiaires, y compris les hanches, d'un roux clair, pattes postérieures à hanches deux fois aussi longues et deux fois aussi grosses que les intermédiaires, leur tibia et leur tarse densément pubescent de gris, métatarse égalant les 4 articles suivants réunis, les articles 2-4 graduellement raccourcis, 5<sup>e</sup> égalant les 3 précédents réunis. Pétiole avec 2 arêtes convergentes en avant, moitié antérieure du 5<sup>e</sup> tergite, 6<sup>e</sup> et 7<sup>e</sup> tergite en avant couverts de points denses et très gros; les tergites se prolongent latéralement au-delà des sternites en forme de lobes translucides.

Taille: 7.5 mm.

Localité: LUZON, Laguna, Mont Maquilang (C. F. Baker).

## TWO NEW CYPRINOID FISHES OF THE GENUS BARBUS FROM LAKE MANGUAO, PALAWAN, P. I.

By ARTEMAS L. DAY

*(From the Department of Zoölogy, College of Liberal Arts,  
University of the Philippines)*

One plate

During the long vacation at the end of the University year 1912-13, a joint expedition from the University of the Philippines and the Bureau of Science was made to Palawan Island in the interest of biological study. The party proceeded to Taytay, a village of about 30 houses on a bay of the same name. From the Coast and Geodetic Survey, I had learned of the presence of a lake supposed to be southwestward of Taytay. Exploration led to the location not only of one lake near Taytay, but of two, one of them, however, being more of a swamp full of grass than a lake except in the rainy season.

Lake Manguao is about 5 kilometers long from east to west and from 2.5 to 3 kilometers wide from north to south. The greatest depth discovered was 7 fathoms, a little to the south-east of Bamboo or Cemetery Island, between the island and the shore. There are very many islands in the lake, perhaps as many as 25. These vary in size from a mere point of rock to those having an area of perhaps 1 hectare.

Two trips were made to the larger of these lakes, Lake Manguao, from which the new species of fishes, described in this paper, were taken. With the exception of the shore along the south side of the lake, which was mainly a sandy beach, there was a shelving shore and small rock fragments, in many places falling precipitously into the water. Some of the fishes were taken from the extreme northeastern part of the lake nearest to the town of Bantolan, but most were taken on the western side near the site of the second camp. Many of the larger fishes were readily caught with hook and line. The smaller ones were taken in large numbers on a small net of cheesecloth baited with cooked rice. This was placed in shallow water and raised when a considerable number of fishes were feeding above it.

In this paper, "length of body" is the distance from the tip of snout to the end of the caudal vertebræ; "length of head" means from the tip of snout to the posterior margin of the hard opercle; "length of caudal peduncle" covers the distance from the posterior margin of anal to the uncovered ventral margin of the caudal fin; "length of snout" refers to the distance

from the median anterior point of the snout to the nostril; "snout to occiput" covers the distance from the tip of the snout to the posterior median dorsal line of the head; "height of dorsal" and "height of anal" refer to the distance from the distal ends of the longest rays to their proximal ends, even though they may be somewhat covered by scales at their proximal ends.

***Barbus bantolanensis* sp. nov.**

Length of head 2.85 to 3.2 in total length; depth of body 2.5 to 2.9 in total length; diameter of eye 5.3 to 5.8 in head, that is, to the posterior margin of the hard opercle; diameter of eye 1.84 to 2.06 in interorbital space and 1.08 to 1.35 in snout; rostral barbel 1 to 1.3 in diameter of eye and  $\frac{2}{3}$  to  $\frac{3}{4}$  in maxillary barbel.

Type, No. 2.

Measurements of 6 specimens of *B. bantolanensis* are given in Tables I and II.

TABLE I.—Measurements of *Barbus bantolanensis* sp. nov.

	Specimen No.—					
	1	2	3	4	5	13
	Per cent. <sup>a</sup>	Per cent. <sup>a</sup>	Per cent. <sup>a</sup>	Per cent. <sup>a</sup>	Per cent. <sup>a</sup>	Per cent. <sup>a</sup>
Length of body.....	b 89	b 118	b 102	b 105	b 107	b 115
Length of head.....	0.320	0.313	0.352	0.314	0.336	0.353
Depth of body.....	0.382	0.377	0.352	0.366	0.390	0.345
Depth of caudal peduncle.....	0.140	0.152	0.137	0.147	0.168	0.128
Length of caudal peduncle.....	0.185	0.169	0.171	0.176	0.168	0.176
Length of snout.....	0.073	0.080	0.088	0.081	0.070	0.088
Diameter of eye.....	0.067	0.059	0.063	0.061	0.065	0.061
Interorbital width.....	0.101	0.122	0.122	0.119	0.120	0.123
Depth of head.....	0.213	0.228	0.230	0.228	0.219	0.247
Snout to occiput.....	0.230	0.245	0.240	0.240	0.240	0.256
Snout to dorsal.....	0.601	0.601	0.607	0.633	0.602	0.626
Snout to ventral.....	0.533	0.533	0.578	0.542	0.562	0.566
Length of dorsal base.....	0.157	0.156	0.151	0.166	0.154	0.154
Length of anal base.....	0.089	0.084	0.088	0.109	0.093	0.079
Height of dorsal.....	0.202	0.199	0.215	0.209	0.205	0.207
Height of anal.....	0.157	0.165	0.156	0.142	0.153	0.163
Length of pectoral.....	0.174	0.177	0.215	0.193	0.177	0.216
Length of ventral.....	0.174	0.169	0.186	0.180	0.186	0.190
Length of caudal.....	0.314	0.305	0.343	0.333	0.336	0.347
Dorsal rays <sup>c</sup> .....	III-8	III-8	III-8	III-8	III-8	III-8
Anal rays <sup>c</sup> .....	III-5	III-5	III-5	III-5	III-5	III-5
Scales in lateral line.....	26	25	25	26	26	26
Scales above lateral line.....	4½	4½	4½	4½	4½	4½
Scales below lateral line.....	4	4	4	4	4	4
Scales before dorsal.....	9	9	9	9	9	10

<sup>a</sup> Referred to length of body. <sup>b</sup> Measurement in millimeters. <sup>c</sup> Spinous and soft rays, respectively.



TABLE II.—Proportional measurements of *Barbus bantolanensis* sp. nov.

Proportional measurement.	Specimen No.—					
	1	a 2	3	4	5	13
Head in body .....	3.06	3.05	2.79	3.04	2.97	2.82
Depth in body .....	2.61	2.62	2.70	2.69	2.48	2.89
Eye in head .....	4.83	5.42	5.66	5.30	5.14	5.71
Snout in head .....	4.14	3.45	4.05	3.45	3.60	3.63
Interorbital space in head .....	3.22	2.81	2.80	2.65	2.70	2.92
Third dorsal spine in head .....	1.70	1.94	1.92	1.81	2.00	2.10
Dorsal .....	III-8	III-8	III-8	III-8	III-8	III-8
Anal .....	III-5	III-5	III-5	III-5	III-5	III-5
Scales .....	26: $\frac{4\frac{1}{2}}{4}$	25: $\frac{4\frac{1}{2}}{4}$	25: $\frac{4\frac{1}{2}}{4}$	26: $\frac{4\frac{1}{2}}{4}$	26: $\frac{4\frac{1}{2}}{4}$	26: $\frac{4\frac{1}{2}}{4}$
Scales between lateral line and base of ventrals .....	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$
Distance from tip of snout to base of dorsal in distance from tip of snout to end of caudal vertebræ .....	0.601	0.621	0.607	0.628	0.626	0.637
Pharyngeals .....	b 2-5-3-2	(?)	2-5-3-2	c 2-5-3-2	c 5-3-2	d 4-2-1
Origin of ventrals .....	midway between origin of pectorals and of anal.					(e)

<sup>a</sup> Type. Plate I, fig. 1.

<sup>b</sup> 2. As some were missing, the arrangement could not be definitely determined.

<sup>c</sup> Another pharyngeal was found; it was probably of the first row.

<sup>d</sup> Several pharyngeals were missing.

<sup>e</sup> Origin of ventrals is 0.474 of distance from origin of pectorals to origin of anal.

### *Barbus manguaoensis* sp. nov.

Length of head  $2\frac{3}{4}$  to 3 in total length; depth of body 2.5 to 2.7 in total length; diameter of eye 4 to 6 in head; interorbital width  $2\frac{1}{3}$  to  $3\frac{1}{4}$  in head, that is, to the posterior margin of the hard opercle; diameter of eye  $1\frac{1}{2}$  to  $2\frac{3}{4}$  in interorbital space and 1 to  $1\frac{2}{3}$  in snout; posterior barbel  $1\frac{1}{3}$  times as long as the diameter of eye and  $\frac{4}{5}$  of the length of the maxillary barbel; third dorsal spine strong, strongly serrated, and  $1\frac{1}{2}$  to  $2\frac{1}{3}$  in head; anterior side of the first dorsal spine 0.57 to 0.61 of the distance from the snout to the end of the vertebræ; origin of dorsal posterior to origin of ventral. A distinct large black ocellus over the end of the caudal vertebræ, one above base of anal, one above base of ventrals, and one elongated area above posterior margin of opercle. These spots are more or less connected by not very distinct broad black bands.

Type, No. 15.

Measurements of 6 specimens of *Barbus manguaoensis* are given in Tables III and IV.

TABLE III.—Measurements of *Barbus manguaoensis* sp. nov.

	Specimen No. and sex.					
	6 ♀.	9 ♀.	15 ♂.	26 ♂.	29 ♀.	31 ♀.
	Percent. <sup>a</sup>	Percent. <sup>a</sup>	Percent. <sup>a</sup>	Percent. <sup>a</sup>	Percent. <sup>a</sup>	Percent. <sup>a</sup>
Length of body.....	b 117	b 132	b 89	b 54	b 52	b 59
Length of head.....	0.350	0.329	0.325	0.324	0.317	0.336
Depth of body.....	0.401	0.371	0.387	0.370	0.384	0.364
Depth of caudal peduncle.....	0.153	0.141	0.142	0.129	0.157	0.142
Length of caudal peduncle.....	0.179	0.193	0.172	0.185	0.182	0.184
Length of snout.....	0.098	0.088	0.084	0.083	0.076	0.089
Diameter of eye.....	0.059	0.056	0.067	0.083	0.076	0.084
Interorbital width.....	0.126	0.121	0.101	0.111	0.105	0.117
Depth of head.....	0.239	0.229	0.224	0.222	0.230	0.226
Snout to occiput.....	0.269	0.242	0.235	0.240	0.250	0.260
Snout to dorsal.....	0.640	0.621	0.634	0.620	0.615	0.630
Snout to ventral.....	0.575	0.575	0.550	0.527	0.528	0.537
Length of dorsal base.....	0.153	0.161	0.162	0.160	0.163	0.168
Length of anal base.....	0.094	0.091	0.108	0.092	0.102	0.084
Height of dorsal.....	0.192	0.185	0.191	0.231	0.240	0.218
Height of anal.....	0.141	0.141	0.146	0.157	0.168	0.159
Length of pectoral.....	0.205	0.174	0.207	0.203	0.211	0.210
Length of ventral.....	0.179	0.166	0.179	0.185	0.192	0.184
Length of caudal.....	0.324	0.300	0.337	0.342	0.336	0.325
Dorsal rays <sup>c</sup> .....	III-8	III-8	III-8	III-8	III-8	III-8
Anal rays <sup>c</sup> .....	III-5	III-5	III-5	III-5	III-5	III-5
Scales in lateral line.....	27	28	27	27	27	27
Scales above lateral line.....	4½	4½	4½	4½	4½	4½
Scales below lateral line.....	4	4	4	4	4	4
Scales before dorsal.....	9	9	9	9	9	9

<sup>a</sup> Referred to length of body.<sup>b</sup> Measurement in millimeters.<sup>c</sup> Spinous and soft rays, respectively.TABLE IV.—Proportional measurements of *Barbus manguaoensis* sp. nov.

Proportional measurement.	Specimen No. —					
	6	9	a 15	26	29	31
Head in body.....	2.92	3.00	3.06	3.000	3.150	2.83
Depth in body.....	2.43	2.75	2.57	2.840	2.600	2.79
Eye in head.....	5.71	5.86	3.16	3.750	4.125	4.66
Snout in head.....	3.32	4.00	3.56	4.030	4.125	3.81
Interorbital space in head.....	2.76	2.66	3.16	2.916	2.750	3.00
Third dorsal spine in head.....	2.27	2.20	1.74	1.520	1.540	1.75

<sup>a</sup> Type, Plate I, fig. 3.

TABLE IV.—Proportional measurements of *Barbus* etc.—Continued.

Proportional measurement.	Specimen No.—					
	6	9	a 15	26	29	31
Dorsal.....	III-8	III-9	III-8	III-8	III-8	III-8
Anal.....	III-5	III-5	III-5	III-5	III-5	III-5
Scales.....	27: $\frac{4\frac{1}{2}}{4}$	28: $\frac{4\frac{1}{2}}{4}$	27: $\frac{4\frac{1}{2}}{3\frac{1}{2}}$	27: $\frac{4\frac{1}{2}}{4}$	27: $\frac{4\frac{1}{2}}{3\frac{1}{2}}$	27: $\frac{4\frac{1}{2}}{4}$
Scales between lateral line and base of ventrals.....	2 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$
Distance from tip of snout to base of dorsal in distance from tip of snout to end of caudal vertebræ.....	0.662	0.625	0.629	0.615	0.615	0.608
Pharyngeals.....	b 5-3-2	b 5-3-2	b 2-5-2-2	b 5-3-1-?	b 4-2	b 2-5-3-2
Origin of ventrals.....	(c)	midway between origin of pectorals and origin of anal.				

<sup>a</sup> Type, Plate I, fig. 3.

<sup>b</sup> 2. As some were missing, the arrangement could not be definitely determined.

<sup>c</sup> Origin of ventrals, 0.532 of distance from origin of pectorals to base of anal.

In comparing these new species with *Barbus ivis* Seale and *B. palawanensis* Boulenger, certain striking differences of body proportions are apparent. The length of head in body is much less, the diameter of eye in depth of body is much greater, the depth of head in body is less, the distance from snout to occiput is much less, the length of base of dorsal in body is more, the height of dorsal and of anal in body is more, and the length of pectoral in body is more in *B. ivis* and *B. palawanensis* than in the two new species here described.

In these two new species, not only are there three rows of pharyngeals as stated by Günther,<sup>1</sup> but another row was discovered consisting of three pharyngeal teeth, so that the pharyngeals are 3-5-3-2 instead of 5-3-2. The extra row of pharyngeals was also found in specimens of *Barbus ivis* Seale and *B. palawanensis* Boulenger.

Unfortunately, several specimens of the species here described were dissected before the extra pharyngeals were discovered. But because of the fact that they were definitely determined in several specimens and because a part of the pharyngeals of this extra row were seen in several other specimens, there can be no doubt of the existence of the extra row, and it is undoubtedly always present in both of these species. In some of the fishes dissected, as in *B. bantolanensis*, No. 45, from which the drawing of the pharyngeals was made, these pharyngeals are very minute. The microscope is often necessary to identify them.

<sup>1</sup> *Cat. Fishes Brit. Mus.* (1868), 7, 3 and 84.

Those of the extra row differ from the other pharyngeals in being not inserted in the bone, but embedded in the tissue surrounding the bone. They may thus be easily detached and lost unless great care is used in the dissection.

While working on the species of this paper, I had access to the type specimen of *Barbus ivis* Seale, taken by Seale on Balabac Island, August 11, 1908, and to other specimens of this species and several specimens of *Barbus palawanensis* Boulenger, collected by Seale at Puerto Princesa, Palawan, on August 20, 1909. I wish to acknowledge the valuable assistance rendered by Mr. Seale while I was working on these species and to express my appreciation for the use of his private library on the Cyprinidæ.

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## ILLUSTRATIONS

### PLATE I

- FIG. 1. *Barbus bantolanensis* Day, sp. nov. No. 2. (Drawn by Rodolfo Fajardo.)
2. Pharyngeal of *B. bantolanensis*, No. 45; A, the additional row of teeth. (Drawn by Rodolfo Fajardo.)
3. *Barbus manguaoensis* Day, sp. nov. No. 15. (Drawn by José Santos.)



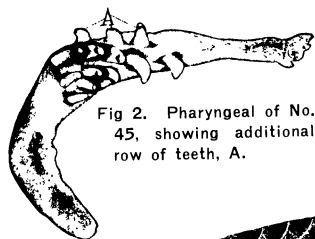


Fig 2. Pharyngeal of No. 45, showing additional row of teeth, A.

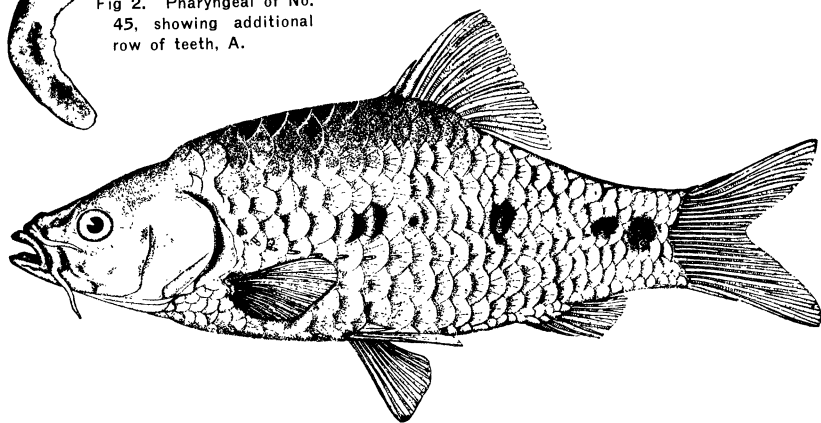


Fig. 1. *Barbus bantolanensis* Day, sp. nov. No. 2.

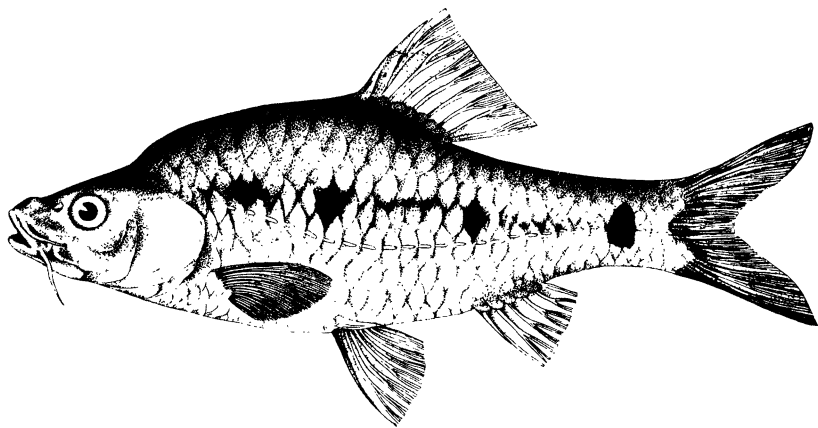


Fig. 3. *Barbus manguaoensis* Day, sp. nov. No. 15.





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## SOME PHILIPPINE SCYPHOMEDUSÆ, INCLUDING TWO NEW GENERA, FIVE NEW SPECIES, AND ONE NEW VARIETY

By S. F. LIGHT

(From the Zoölogical Laboratory, College of Liberal Arts,  
University of the Philippines)

Sixteen text figures

The Scyphomedusæ described in this paper are in the museum of the zoölogical department of the University of the Philippines. Many of them were collected on the joint scientific expeditions of the University of the Philippines and the Bureau of Science, while others were collected at various times by members of the zoölogical department. They are not the result of a systematic collection of Philippine Scyphomedusæ which, judging from the percentage of new species in the Philippine collections of the United States Bureau of Fisheries steamer *Albatross*<sup>1</sup> and in the present collection, should produce many new and interesting forms.

The collection includes medusæ of 12 species in 11 genera, and 1 doubtful immature form. All but three are new to the Philippines, and 2 genera, 5 species, and 1 variety are new to science. A list of the genera and species follows. Those starred are reported from the Philippines for the first time. The new genera and species are indicated by black-faced type.

- |  |  |
|--|--|
| 1. <i>Chiropsalmus quadrigatus</i> Haeckel.                                  | 7. <i>Catostylus purpurus</i> Mayer.               |
| *2. <i>Dactylometra quinquecirrha</i> L. Agassiz, " <i>Chrysaora</i> stage." | *8. <i>Mastigias papua</i> L. Agassiz.             |
| 3. <i>Aurellia labiata</i> Chamisso and Eysenhardt.                          | *9. <i>Acromitus maculosus</i> gen. et sp. nov.    |
| *4. <i>Cassiopea polypoides</i> Keller var. <i>culionensis</i> var. nov.     | *10. <i>Lobonema mayeri</i> sp. nov.               |
| *5. <i>Cassiopea medusa</i> sp. nov.   | *11. <i>Lobonemoides gracilis</i> gen. et sp. nov. |
| *6. <i>Cephea cephea</i> (Forskål) Mayer.                                    | *12. <i>Rhopilema visayana</i> sp. nov.            |
|  | 13. <i>Cassiopea polypoides</i> Keller (?).        |

<sup>1</sup> Mayer, A. G., Medusæ of the World, *Pub. Carnegie Inst. Wash.* (1910), No. 109, 3.

It will be noted that 8 of the species reported, including all the new forms, belong to the suborder Rhizostomæ. This essentially tropical suborder seems to include the greater part of the Philippine forms as 16 of the 29 species and varieties reported from the Islands belong to that group. There are undoubtedly many medusæ new to science and others as yet unreported from the Philippines to be found in the waters of the Archipelago. While on launch trips, during May and June, 1913, along the coast of Palawan and the islands between Palawan and Culion, I saw many medusæ not found in this collection. Most of them were Rhizostomæ, but at least three species of Pelagidæ were common. Large Beroë-like ctenophores were also very numerous, but attempts to preserve them were unsuccessful.

While I have attempted to give a fairly complete description of new species and a sufficiently complete description of old species for diagnostic purposes, I have not attempted detailed anatomical discussions. In the diagnosis of old species, and in matters of general classification, I have followed very closely Mayer's monumental work, *The Medusæ of the World*. Full synonymies of previously described species will be found in that work.

Mayer describes 20 species and varieties of Scyphomedusæ which have been reported from the Philippines. The fact that all but one of these were reported for the first time from the *Albatross* collection made during the years 1908 to 1910 shows how little attention has been paid to the collecting of Scyphomedusæ in Philippine waters. The present paper adds 9 species and varieties, making a total of 29 species and varieties of Scyphomedusæ from the Philippines. A list of these, with localities when known, follows.

1. *Carybdea rastonii* Haacke, Luzon and Mindoro [Mayer, 1910].
2. *Carybdea alata* Reynaud var. *moseri* Mayer=*Charybdea philippina* Haeckel [Semper, 1860].
3. *Chiropsalmus quadrigatus* Haeckel, common [Mayer, 1910] [Light, 1914].
4. *Periphylla hyacinthina* Steenstrup forma *dodecabostrycha* (Haeckel) Mayer [Mayer, 1910].
5. *Linuche aquila* (Haeckel) Mayer, Mactan [Mayer, 1910].
6. *Atolla bairdii* Fewkes forma *valdiviæ* Vanhöffen, Albatross station 5202 [Mayer, 1910].
7. *Atolla wyvillei* Haeckel, Albatross station 5201 [Mayer, 1910].
8. *Pelagia panopyra* Péron and Lesueur var. *placenta* (Haeckel) Mayer [Mayer, 1910].
9. *Dactylometra quinquecirrha* L. Agassiz, "*Chrysaora* stage," Manila Bay [Light, 1914].
10. *Sanderia malayensis* Goette, Sulu Sea [Mayer, 1910].

11. *Discomedusa philippina* Mayer, Catingan Bay [Mayer, 1910].
12. *Aurellia labiata* Chamisso and Eysenhardt, Masbate [Mayer, 1910], Palawan and Manila Bay [Light, 1914].
13. *Cassiopea polypoides* Keller var. *culionensis* Light, Culion Bay, Culion [Light, 1914].
14. *Cassiopea medusa* Light, Culion Bay, Culion [Light, 1914].
15. *Cassiopea ornata* Haeckel, Simaluc Islands, Subic Bay, Luzon and Samar [Mayer, 1910].
16. *Cephea cephea* (Forskål) Mayer, Mariveles [Light, 1914].
17. *Cephea octostyla* L. Agassiz, Jolo [Mayer, 1910].
18. *Catostylus purpurus* Mayer, Manila Bay [Mayer, 1910] [Light, 1914].
19. *Lychnorhiza bartschi* Mayer, Jolo [Mayer, 1910].
20. *Mastigias papua* L. Agassiz, Mindoro and Palawan [Light, 1914].
21. *Mastigias ocellata* Haeckel [Mayer, 1910].
22. *Versura maasi* Mayer, Bohol [Mayer, 1910].
23. *Lobonema smithii* Mayer, Manila Bay [Mayer, 1910].
24. *Lobonema mayeri* Light, Malampaya Sound, Palawan and Manila Bay [Light, 1914].
25. *Lobonemoides gracilis* Light, Palawan [Light, 1914].
26. *Acromitus maculosus* Light, Palawan [Light, 1914].
27. *Thysanostoma thysanura* Haeckel, Mindanao and Mindoro [Mayer, 1910].
28. *Lorifera flagellata* (Haeckel) Mayer, Albatross station D. 5226 [Mayer, 1910.]
29. *Rhopilema visayana* Light, Palawan [Light, 1914].

## IMMATURE FORM

*Cassiopea polypoides* Keller (?), Port Galera Bay, Mindoro [Light, 1914].

## Order CARYBDEIDÆ

Genus **CHIOPSALMUS** L. Agassiz, 1862

**Chiropsalmus quadrigatus** Haeckel.

The bell is dome shaped and 4-sided, with an evenly rounded aboral surface. Four laterally flattened, hand-shaped, inter-radial pedalia arise from the sides of the bell a short distance above the velar margin. Each bears from 5 to 9, typically 7, finger-shaped projections, each of which gives rise to a very long, slender, flexible, hollow tentacle banded with nematocysts. There are 4 perradial sense clubs in covered notches in the sides of the bell, a little above the level of origin of the pedalia. A distinct velarium supported by a bracketlike, perradial frenulæ stretches partly across the mouth of the bell cavity. The central stomach is short and wide, with 4 lanceolate lips with simple margins. From each of the flattened perradial sides of the stomach arises a pair of gastric saccules which project downward into the bell cavity. Each saccule is laterally flattened and cockscomb shaped with an irregularly notched margin.

This distinguishes the medusa from *C. quadrumanus*, the most nearly related form, which has finger-shaped saccules.

This medusa was very abundant in Taytay Bay, Palawan, and in Culion Bay, Culion, in May and June, 1913. Numerous specimens were obtained, including many immature forms. They agree exactly with Mayer's description of specimens collected in Philippine waters by the *Albatross*. Much larger specimens were seen than any as yet reported, some in Culion reaching a diameter of at least 200 mm. There are 7 tentacles to each pedulum in by far the greater number of specimens, and these tentacles show in life narrow, lavender bands of nematocysts. The tentacles are very long, slender, and flexible, reaching a length of 1.5 meters or more. They are very delicate, and usually break off and remain attached to the clothing or the body when encountered in the water.

The sting of this medusa is very dangerous. One of the women in the party of the expedition to Palawan, who was stung while in bathing, was very seriously ill. I have described the symptoms more in detail in another place.<sup>2</sup> Swelling and inflammation began almost immediately in the areas which came in contact with the tentacles, and later blisters formed along the lines marked by contact with the tentacles. The lower limbs became swollen, the heart action was impaired, respiratory spasms and nervous twitchings of the muscles ensued, and the patient experienced intense general pain. The natives of Palawan reported a number of deaths caused by the sting of this medusa.

Mayer reports this medusa in the *Albatross* collection from Masbate, Luzon, and Mindanao, and I have found it plentiful in Culion and Palawan, from which it may be seen that it has a wide range in the Philippines.

#### Family PELAGIDÆ

#### Genus DACTYLOMETRA L. Agassiz, 1862

#### *Dactylometra quinquecirrha* L. Agassiz, "*Chrysaora* stage."

At certain seasons of the year, particularly in October and November, this medusa is found in large numbers in Manila Bay where it is a menace to bathers and fishermen who hold it in great fear. While all the specimens which I have seen have shown only 24 tentacles and 32 marginal lappets and many of them are apparently sexually mature, this medusa agrees so closely in every other respect with *D. quinquecirrha* that I have considered it as the "*Chrysaora* stage" of that species,

<sup>2</sup> *This Journal*, Sec. B (1914), 9, 291.

corresponding to the similar "*Chrysaora* stage" of the species found in the bays of the Atlantic Coast of the United States.

The flatly rounded bell is from 70 to 100 mm. in diameter. There are 24 marginal tentacles of about equal length. In life, these reach a maximum length of almost a meter. In preserved specimens, they are seldom perfect and are much contracted, not usually exceeding a length of twice the bell diameter. There are 32 bluntly rounded marginal lappets, and the 2 next the sense organs in each octant are usually about one-half as wide as the 2 between the tentacles. The sense organs are marked by shallow notches in the margin. They are covered above by a shelf of tissue nearly twice as wide as the length of the sense club. Below they are exposed, but lie in deep narrow furrows. The mouth arms are complexly folded, presenting along their edges regular pairs of extended points. They are from two to three times as long as the bell radius in preserved specimens and many times as long in life. The umbrella is transparent white, and is covered on the exumbrellar surface with tiny, semiopaque, white spots. The 16 stomach pouches are semiopaque, the dividing membranes entirely transparent, and the exumbrellar radial muscle strands opaque white. The gonads are light yellow, light brown, or yellow with a lavender tinge, the inner edges of the oral palps are light transparent pink to light lavender brown, and the tentacles are opaque white.

This medusa is known to be very dangerous. The natives call it *fosforo* ("match" in Spanish). This name is used by the fishermen, because the long oral arms suggest the stick and the bell the head of a match. I have heard of several cases of severe poisoning from this medusa both among natives and Americans. The native remedy is sugar solution taken internally and external applications of vinegar.

Old<sup>3</sup> has reported a number of cases of poisoning from jellyfish in which there was a definite symptom complex differing from that in the case of poisoning by *Chiropsalmus quadrigatus* already mentioned. Mayer<sup>4</sup> cites Doctor Smith<sup>5</sup> as considering that these cases of poisoning were due to the sting of *Lobonema smithii* Mayer. It seems more probable that they were due to *Dactylometra*, since it is so common in the bay and is the form commonly considered to be poisonous by the natives, especially the fishermen. I have not seen *L. smithii*, but the

<sup>3</sup> *This Journal*, Sec. B (1908), 3, 329.

<sup>4</sup> *Pub. Carnegie Inst. Wash.* (1910), No. 109, 3, 690-691.

<sup>5</sup> Dr. Hugh M. Smith, deputy United States fish commissioner.

sting of *L. mayeri* sp. nov., a closely related form, while unpleasant is not dangerous. I hope to be able to report more fully on this matter in the future.

## Order SEMÆOSTOMEÆ

Genus **AURELLIA** Péron and Lesueur, 1809

***Aurellia labiata*** Chamisso and Eysenhardt.

The margin is divided into 16 velar lobes. The bell margin projects downward from the subumbrellar side as a velumlike membrane, forming a fold between each 2 sense organs. The tentacles and marginal lappets have moved a considerable distance up the sides of the exumbrella. The subgenital ostia are very small.

This seems to be a rather widely distributed form in Philippine waters, as Mayer reports it from Masbate from specimens in the *Albatross* collection and we have specimens from Taytay, Palawan, and Manila Bay. We have 4 specimens in our collection, 2 collected by Dr. R. P. Cowles in Taytay, Palawan, and 2 from Pasay Beach, Manila Bay. They all show the 16 notches in the bell margin, the velumlike subumbrellar membrane marking the true margin, and the very small subgenital ostia which characterize *A. labiata*, so I have considered them as belonging to that species in spite of rather marked individual differences and differences in proportion as compared with other specimens whose measurements are given by Mayer.

The smallest specimen (D in the table) is relaxed, flabby, and without definite shape. The bell is only 10 mm. thick at the base of the mouth arms, and the whole medusa has the appearance of having completely relaxed in death. The marginal tentacles are very slender and flexible, and are from 12 to 15 mm. in length.

In another specimen (B in the table), the bell thickness at the base of the mouth arms is 25 mm. The material of the umbrella has a very solid, stiff consistency, and is thick up to the tentacle zone. It appears to be in a state of contraction, and nearly all the marginal tentacles are tightly contracted. The velumlike margin is here represented only by a very slight fold which has the appearance of a line connecting the sense organs. The thick bell with a solid consistency and the rounded genital pouches and small ostia give it a resemblance to *A. solida* Browne. Owing to the condition of the specimen, it was impossible to determine the arrangement of the sense organs, but the 16 velar lobes show that the medusa is *A. labiata*.

Measurements of *Aurellia labiata*.

Specimen.	Diameter of the umbrella.	Diameter across the zone of gonads.	Length of each mouth arm.
	mm.	mm.	mm.
A .....	225	107	100
B .....	167	86	71
C .....	150	65	-----
D .....	145	50	65

## Order RHIZOSTOMÆ

## RHIZOSTOMATA PINNATA Vanhöffen

Genus *CASSIOPEA* Péron and Lesueur, 1809

*Cassiopea polypoides* Keller var. *culionensis* var. nov. (fig. 1).

*Type*.—No. C. 2420, zoölogical collection, University of the Philippines.

The disk is flat, from 120 to 150 mm. in diameter, with a broad, shallow sucker cavity and a central thickened area. The thickened outer margin of the sucker cavity is from 15 to 20 mm. from the margin of the bell, and the diameter of the sucker is about two-thirds of the bell diameter. The margin is thin and divided into from 16 to 20 parameres by as many sense organs. There are twice as many radial canals as sense organs, and there is no ring canal. Each paramere has 5 blunt marginal lappets, the lappet in the center of each paramere being the largest, the 2 ocular lappets being about one-half as wide as the 2 on each side of this central lappet. The sense organs show no pigment spot. The mouth arms are from 1.25 to 1.5 as long as the bell radius, and project considerably beyond the bell margin. They are cylindrical or somewhat dorsally flattened in their proximal portions and higher than broad in their distal portions. The arms give rise in their proximal portion to about 3 pairs of short, alternately arranged lateral branches beyond which the arm divides to form from 3 to 5 long branches which may in turn subdivide. There are numerous, small, berrylike vesicles between the mouths over the entire surface of the arms. In most specimens, there is a central flattened appendage in the center of the arm disk

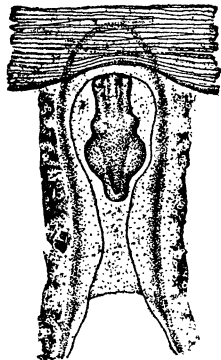


FIG. 1. *Cassiopea polypoides* Keller var. *culionensis* var. nov., a sense organ from the subumbrellar side. Much enlarged.

surrounded by a whorl of smaller similar appendages. This central appendage reaches a length of 30 mm. and a width of 40 mm. The arms may have toward their distal ends a number of ribbonlike or leaflike appendages, reaching a length of 20 mm. and a width of from 8 to 15 mm. Of the 27 specimens in the collection, 10 have the large central appendage and a whorl surrounding it, 11 have a large central appendage without a surrounding whorl, 3 have no enlarged appendage, and 3 have enlarged appendages on the arms but none in the center of the disk.

The central stomach is circular in outline, and is encroached on from below by the 4 gonads. Twice as many radial canals as sense organs originate from it and extend to the margin, giving off branches which form a very complex network of anastomosing vessels. The rhopalar canals increase in size toward the margin, while the interrhopalar canals become small distally.

In preserved specimens the umbrella is light olive green. On close examination dull white bands may be seen running to each sense organ. The mouth arms usually exhibit 3 color zones: A central circular area which is yellow, a zone composed of the portions of the arms projecting beyond the disk which is also yellow, and between these zones a zone of green. The appendages are opaque white, and contain a network of canals, giving them a leaflike appearance. The color of the live medusa is very similar to that of the preserved specimens.

*Measurements and numbers of sense organs and of marginal lappets to a paramere of 14 specimens from Culon.*

Specimen No.	Diameter of the bell.	Diameter of the arm disk.	Length of the mouth arms (from the center of the arm disk).	Sense organs.	Marginal lappets to a paramere.
	mm.	mm.	mm.		
1 .....	121	50	95	20	5
2 .....	129	58.5	89	20	5
3 .....	120	55	90	16	5
4 .....	128	58	99.5	20	5
5 .....	145	57	104	19	5
6 .....	130	58	112	17	5
7 .....	130	60	99	20	5
8 .....	143	50	102	19	5
9 .....	151	79	145	17	5
10 .....	145	62	120	17	5
11 .....	145	63	114	16	5
12 .....	154	68.5	176	19	5
13 .....	118	60	95	18	5
14 .....	150	60	120	16	5



The museum has 27 specimens of this new variety of *C. polypoides* collected by Dr. L. E. Griffin and Mr. L. D. Wharton in Culion Bay, in October, 1911. They were present in great numbers in the bottom of a boat slip near the Leper Colony pier. I found them in the same place in May, 1913, and Dr. Ernest Clements, the superintendent of the Leper Colony, tells me that they are nearly always to be found there. This boat slip is from 1 to 2 meters deep, is protected from storms, and has a sandy bottom; it seems to be an ideal habitat for the medusæ. They were all found lying with the exumbrellar surface downward and looked, as Keller<sup>6</sup> has remarked of *C. polypoides* forma typica in the Red Sea, extraordinarily like some large sea anemone. They are able to retain their hold firmly by means of the sucker cavity. Indeed, when the preserved specimens are placed with the exumbrella down in a glass dish, it is practically impossible to turn them over by lifting on the arms and arm disk. The living medusæ on being turned over immediately begin to pulsate. At each contraction, the arms of one side are pulled farther in and bent upward thus lifting the disk on that side. A final pulsation causes it to fall over on the exumbrellar surface, the pulsations cease, and the arms and margin are slowly adjusted.

This medusa resembles *C. polypoides* forma typica in general appearance, in the number of lappets to a paramere, in the length and branching of the mouth arms, in the canal system, and to some extent in the coloring. While it differs in some particulars, such as in the shape of the central stomach and the lack of pigmentation in the sense organs, I do not consider these differences sufficient to warrant the making of a new species in a genus which contains so many intergrading forms, and so I have considered it as a new variety of *C. polypoides* to which I have given the name *culionensis* as Culion seems to be a constant habitat of the medusa.

In coloration of the bell and in the arrangement of the appendages of the mouth arms, this form approaches most nearly to Keller's color variety "rosæ."

*Cassiopea polypoides* Keller (?).

One immature medusa collected in Port Galera Bay in May, 1912, differs from *C. polypoides* var. *culionensis* in having pigmented eyespots, in that the arms do not project beyond the bell margin, and in the arrangement of the appendages

<sup>6</sup> *Zeitschr. f. wiss. Zool.* (1883), 38, 634.

of the mouth arms. It has besides the berrylike vesicles a small central appendage, surrounded by a double whorl of 8 appendages, 2 in the axil between each two arms supported by the same interostial pillar. The appendages of the inner whorl are smaller than those of the outer whorl. Near the distal end of each arm is a large ribbonlike appendage reaching a length of 15 mm. and a width of 4 mm., which is surrounded by a number of similar but smaller appendages. Besides these, there are scattered among the mouths a number of small leaflike appendages.

The entire medusa is, in formalin, a dull grayish white.

Measurements of the specimen in millimeters: Diameter of the bell, 55; diameter of the arm disk, 25; length of the mouth arms (measured from the center of the disk), 26. Number of sense organs, 17; number of lappets to a paramere, 5.

While this is probably an immature individual of *C. polypoides* forma typica, it is impossible to place it definitely, so I have indicated it as a doubtful immature example of that species.

*Cassiopea medusa* sp. nov. (figs. 2 and 3).

*Type*.—C. 2421, zoölogical collection, University of the Philippines, from Culion Bay, Culion.

The disk is flat with a broad, shallow sucking surface bounded externally by a circular raised area and having a broad thickened central disk. The disk measures 260 mm. in diameter, the sucking surface 180 mm., and the raised central disk 115 mm. The raised margin of the sucking surface is 15 mm. wide, and its outer edge is 25 mm. from the bell margin.

There are 17 sense organs, and each paramere contains 7 irregular, very blunt marginal lappets which are often more distinct as spaces between grooves in the exumbrella than as actual lappets in the very thin and nearly smooth margin. The sense organs are very small, slender clubs hidden in deep clefts. They are covered above by a shelf of exumbrellar tissue, but they are quite distinct from the subumbrellar side. They are without pigmented eyespots. The 8 large mouth arms arise from an 8-sided arm disk 114 mm. in diameter. They are 170 mm. in length, send off numerous small lateral branches in their proximal portion, and divide distally into 3 main branches, which are again subdivided. The mouths and branches are much more scattered than in *C. polypoides*, and arising in the axils of the branches and between the mouths from the center of the disk to the distal ends of the branches are hundreds of transparent appendages. These appendages are of two types

which graduate into one another—a small, inconspicuous, ribbon-like form and a large, very flexible form, cylindrical at the base, flattened toward the outer end, and containing a broad central canal. These reach a length of 110 mm. and a diameter of 7.5 mm., giving the animal an appearance remarkably suggestive of the classical Medusa, hence the specific name. The canal system consists, as usual in the genus, of an equal number of ocular and interocular canals. The former run to the sense organs at the margin, while the latter break up into branches some distance inside, which anastomose with those from the ocular canals to form a network of canals running out to the margin. The subgenital ostia are small and considerably longer than broad as opposed to *C. polypoides*.

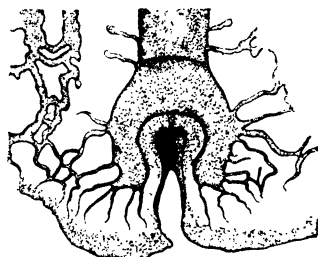


FIG. 2. *Cassiopea medusa* sp. nov., a sense organ and the adjacent canal system from the subumbrellar side. Very much enlarged.

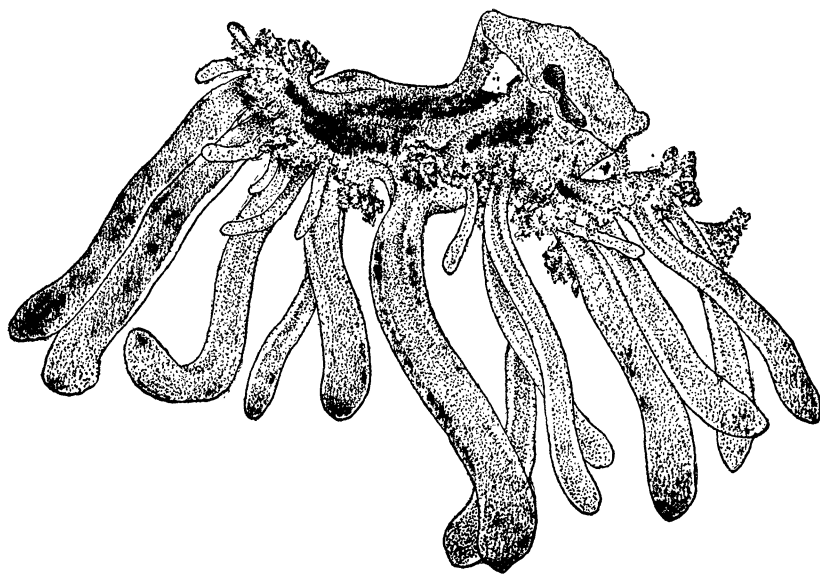


FIG. 3. *Cassiopea medusa*, a portion of a mouth arm, showing the scattered mouths and the very typical appendages.  $\times 1$ .

In the preserved specimen the disk is opaque white with a slight grayish or greenish tinge. The mouths are light yellow, the arms and appendages are transparent white, and the canals are outlined in semiopaque white.

This very interesting and distinctly new *Cassiopea* is represented by a single specimen collected by Dr. L. E. Griffin and Mr. L. D. Wharton in Culion Bay, where it was found with *C. polypoides* var. *culionensis*. It is most nearly related to *C. polypoides* and *C. xamachana*, but it is differentiated from them as from all other species by the numerous very large appendages, by its very large size, and by the combination in one medusa of the following characteristics: 7 lappets to a paramere, mouth arms longer than the bell radius, and an unpigmented sense organ.

Owing to the extreme fragility of the specimen, it is impossible to make as complete a description as might be desired.

#### RHIZOSTOMATA DICHOTOMA Vanhöffen

Genus **CEPHEA** Péron and Lesueur, 1809

*Cephea cephea* (Forskål) Mayer.

I have a single worn specimen of this widely distributed species collected at Mariveles, Manila Bay, in January, 1912. It is undoubtedly a form of *Cephea cephea* as shown by the deep clefts of the sense organs and the high, heavily warted central dome. The bell diameter is 220 mm., and the distance from the lower surface of the arm disk to the top of the dome is 120 mm. The 8 mouth arms arise in 4 pairs. Each arm is shorter than the bell radius, and shows decided lateral compression in the proximal portion. The two outer branches are considerably stouter than the inner branches. The mouths are borne only on the faces of the main branches and their sub-branches. Scattered among the mouth arms are numerous short, ribbonlike, narrow appendages which when contracted have a berrylike appearance. These reach a maximum length of 40 mm., most of them being from 10 to 20 mm. in length. There is a very conspicuous set of folded ridges containing the radial muscles and extending from the arm disk to the ring canal, which is about 50 mm. from the margin. On these ridges are numerous very small, flexible, cone-shaped projections. The circular muscles which are also distinct folds lying between the ring canal and the margin are interrupted, partially at least, in the rhopalar radii. The canal system agrees with that given by Mayer for *Cephea cephea*, except that the ocular canals are considerably wider, in their distal portion at least, than are the interocular canals. The subgenital ostia are small, half-moon shaped, convex below, and concave above.

The central dome of the exumbrella is 80 mm. high and

about 70 mm. in diameter. It is covered at the bottom with small granular warts. Toward the top, these increase in size, reaching at the apex a length of 18 mm. and a diameter of 14 mm. They are irregular, and may be slender and pointed or irregular and massive.

The margin is not in a good state of preservation, but there are evidently 8 sense organs, which lie in deep notches, and about 80 marginal lappets—8 velar and 2 ocular between each two sense organs. The lappets show very plainly as thickenings of the gelatinous material, but are not distinct at the edge where they are joined by a web. The dome is transparent rosy pink, shading to light blue at the apex.

#### RHIZOSTOMATA TRIPTERA Vanhöffen sensu Maas

##### Genus *CATOSTYLUS* L. Agassiz, 1862

###### *Catostylus purpurus* Mayer.

The disk is somewhat flatter than a hemisphere in preserved specimens, but more convex than a hemisphere in life. The ex-umbrella is smooth. The 8 rhopalia are flanked by short, narrow, bluntly rounded lappets. In each octant there are 4 cleft and 2 simple velar lappets; in all, 10 velar terminal lappets to an octant. In the whole bell there are 96 marginal lappets, 16 rhopalar, and 80 velar terminal lappets. In any octant the velar lappets are arranged as follows: One cleft lappet, 1 simple lappet, 2 cleft lappets, 1 simple lappet, and 1 cleft lappet.

The arm disk at the base is about half as wide as the bell diameter, and is much smaller at the level of origin of the mouth arms. The long, narrow genital ostia are nearly as wide as the interostial pillars. They are constricted by a thick, wide median projection which extends from the arm disk. A long finger-shaped or swollen papilla is seen on the subumbrellar surface. It arises on the outer margin of the ostia in the line of the rhopalar canal. The subgenital porticus is unitary and cruciform.

The mouth arms are from 0.75 to 1.25 as long as the bell radius, and the mouths extend to the extreme tip of each arm. In living specimens, particularly those that are immature, a considerable part of the mouth arms is covered by edges of the bell. In preserved specimens the bell is flattened and the edges are turned in, leaving the mouth arms exposed.

The circular muscles extend uninterruptedly from the arm disk to the margin, being most prominent between the circular canal and the margin.

Sixteen radial canals, 8 of which are rhopalar and 8 adradial, leave the cruciform central stomach. The ocular canals extend past the ring canal to the sense organs, while the adradial canals end in the ring canal. The fine-meshed network of canals outside the ring canal extends to the margin. The coarser inner network is always connected with the adradial canals, seldom with the ocular canals, and never with the stomach.

The sense organs have in life brilliant silver spots which fade in preserved specimens. The size of these ocelli is in inverse ratio to the size of the medusa.

The medusa is deep purplish brown in life, and fades to dull brown in formalin.

This is the commonest medusa of Manila Bay. During the months of November and December it is especially abundant on the beach at Pasay just outside of Manila. The fishermen say that these jellyfish are blown in by southwest winds which prevail during these months. The largest specimen in the collection measures 105 mm. in bell diameter, but I have seen many considerably larger specimens. Mayer reports this species as living on the bottom in shallow water. I hardly think this is the case, as they are always to be seen on or near the surface in shallow water along the beach and in the esteros (brackish water canals), where they sometimes occur in countless numbers. The immature medusæ vary considerably. Some are transparent white, and resemble in general appearance the immature forms of *Acromitus maculosus* gen. et sp. nov. which is described later in this paper. The chief and most apparent difference is, of course, the absence of appendages of any kind on the mouth arms of *Catostylus*. Others resemble in general form the mature medusæ, but have such striking differences that I have thought it worth while to give a short description of one of them.

*Catostylus purpurus* Mayer, immature form.

The bell, which measures 27 mm. in diameter, is more convex than a hemisphere when relaxed and much more so in contraction. The margin in life hangs down below the short mouth arms, but in formalin is curved inward exposing the mouth arms. There are 8 prominent rhopalia, which in life have a bright silvery color. The exumbrellar sensory pit is broad and shallow and dendritically grooved. The ocular lappets are roundly pointed and longer than the velar lappets. There are typically 10, sharply pointed, narrow, velar lappets between each 2 ocular lappets arranged as in the adult medusa.

The subgenital ostia are irregular in size and from once

to twice as wide as the interostial pillars. The genital porticus is unitary and cruciform. The circular muscles extend uninterrupted from the outer end of the arm disk to the margin.

The arms are 6 mm. long. Each has a swollen area near the base, culminating on the outside in a laterally projecting point beyond which the arms are decidedly narrowed. The mouths are on the lower and inner surfaces of the three branched arms.

In life, the medusa is deep, rich plum; in formalin, it is purplish brown.

This immature form was collected from a seine at Pasay Beach, Manila Bay, October, 1913. It is particularly interesting, because of the presence under the edge of the margin of several small cyclopslike crustacea, evidently leading a commensal existence. Four of these crustaceans were found, each lying just below a sense organ and along the line of a rhopalar canal, the head end lying innermost. They were all females with well-developed egg sacks, and were difficult to make out in position as they have many minute brown pigment spots scattered over the body, giving them the same general color as the medusa.

I have since found that these crustacea are to be found in great numbers on living specimens whether mature or immature and are not confined to any one region of the medusa.

#### Genus *MASTIGIAS* L. Agassiz, 1862

##### *Mastigias papua* L. Agassiz.

There are 3 immature and 2 mature specimens of this medusa in the collection from Port Galera Bay, Mindoro, collected during May and June, 1912. I saw many small specimens in Taytay Bay, Palawan, in May, 1913.

These forms differ somewhat from the typical *M. papua*, and while these differences coincide to some extent with those noted in *M. papua* var. *sibogæ* Maas they differ to about the same extent. They seem to be intermediate in form between *M. papua* var. *sibogæ* and *M. papua* forma typica, and the specimens differ among themselves as to coloration, length of filaments, etc. These facts lead me to believe, as Mayer says, that there are numerous very closely related or even intergrading forms in this genus. It would be interesting to compare large series of these medusæ from localities joining two rather widely separated habitats, say Japan and Papua, getting series from Japan, Formosa, Luzon, Mindanao, Jolo, Amboina, and Papua. I have no doubt that the individuals of such a series would so inter-

grade as to make it necessary to consider them as local forms of a single very variable species.

The largest specimen in the collection measures 60 mm. in bell diameter, and the arm disk is 33 mm. in diameter. The arms measure 35 mm. in length from the center of the arm disk, and project only slightly beyond the edge of the disk. There are 8 rhopalia, with large, cup-shaped, pigmented ocelli and long, pointed, ocular lappets. Between each 2 sense organs are 9 rounded or bluntly pointed velar lappets. The subgenital ostia are three times as wide as the interostial pillars. There are 7 anastomosing interocular canals in each octant. The rounded clubs are scattered on the mouth arms, and the terminal appendages which are somewhat less in length than the bell diameter are distinctly 3-sided and show a network of internal canals. The general color in life is light greenish blue, shading into light brown, purple, or olive green. The exumbrella is covered, particularly in the mature medusa, with prominent white spots. Those above the ring canal are double-headed or dumb-bell shaped. The rhopalar canals are outlined by a broad violet or deep blue band. The arm clubs are violet or blue at the tip and base with intermediate zones of olive green, gray, and white. In preserved specimens the colors fade with the exception of the violet band on the circular canal, which is not present in some immature medusæ, and the violet bases of the terminal appendages.

#### Genus *ACROMITUS* novum <sup>7</sup>

*Generic characters.*—*Rhizostomata triptera* with scattered filaments and axial, terminal, filamentous appendages on the oral arms. The cruciform stomach gives rise to 16 radial canals, 8 of which are rhopalar and 8 adradial and inter-rhopalar. The rhopalar canals extend beyond the ring canal to the margin, while the adradial canals end in the ring canal. Externally, the ring canal sends off many small canals which anastomose and form a network between the ring canal and the margin. Internally, it gives off several larger canals on each side of each rhopalar canal which anastomose and join the rhopalar canals. The exumbrellar sensory pits show radiating furrows. The subgenital porticus is unitary and cruciform. The circular muscle is partially interrupted in the rhopalar radii.

The type species is *A. maculosus* sp. nov. from Taytay Bay, Palawan.

<sup>7</sup> ἄκρος, at the point, terminally; μίτος, a thread.



The genus *Acromitus* is most closely related to *Catostylus* on one hand and less closely to *Lychnorhiza* and *Crambione* on the other. It resembles *Catostylus* in its canal system, the



FIG. 4. *Acromitus maculosus* gen. et sp. nov., lateral view of the medusa.  $\times 8/9$ .

shape and structure of its mouth arms, and in the presence of furrows in the sensory pit, but differs from it in having filaments and an axial terminal appendage on each mouth arm.

While resembling *Lychnorhiza* and *Crambione* to some extent in its canal system, in having filaments on the mouth arms and in the presence of radiating furrows in the sensory pits, it differs from them in having an axial terminal appendage, in that the internal branches of the ring canal join the rhopalar canals, and in that the circular muscles are interrupted, partially at least, in the rhopalar radii. It differs from *Mastigias* in that the exumbrella sensory pit is furrowed, in that the interocular canals are regular in number (8) and in position and do not anastomose, running directly from the central stomach to the ring canal, and in that the axial terminal appendages of the mouth arms are long, slender filaments and not clubs. It differs from *Pseudorhiza* in having slender terminal appendages, in the presence of filaments on the mouth arms, in that the sensory pits are furrowed, and in the absence of a central mouth. It differs from *Phyllorhiza* in having axial terminal appendages and in that the inner branches of the ring canal do not reach the stomach. It differs from *Versura* in that the interradiial canals are separate and in the presence of a definite ring canal. It differs from *Lobonema* most strikingly in the small size of the marginal lappets and in the absence of windowlike apertures in the oral arms. It differs from *Lobonemoides* gen. nov. in that there are not more than 8 rhopalia, in that the interocular canals do not extend to the margin, and in that the axial, terminal appendages of the mouth arms are filamentous.

*Acromitus maculosus* sp. nov. (figs. 4, 5, and 6).

*Type*.—No. C. 2081, zoölogical collection, University of the Philippines.

The bell reaches a width of 90 mm. or more, and is hemispherical or somewhat flatter than a hemisphere. It has a solid consistency, being thick in the central region and thin outside the ring canal. The surface of the exumbrella is covered with minute, bluntly cone-shaped projections. There are 8 rhopalia, each with a pigmented area and a deep, triangular, grooved, exumbrellar sensory pit. The marginal lappets are typically 80 in number—8 pointed velar lappets in 4 pairs and 2 narrow pointed ocular lappets being present in each octant. The grooves between the pairs of velar lappets are deep, and extend some distance up on the exumbrellar surface. The arm disk is about 1.2 or 1.25 of the bell radius. The genital ostia are from 1.3 to 1.5 as wide as the column between them. They have a regular but sinuous outline, and are partially closed by

a median flaplike projection from the outer margin. The sub-genital porticus is cruciform and unitary.

The mouth arms vary in length from 1.3 to twice the bell radius. The proximal area, in the adult, is about 0.25 of the arm length and considerably more in the immature medusa. It is narrow and unbranched, and bears mouths only on its inner side where they extend to the center of the arm disk. The distal portion has the shape of a 3-cornered pyramid, the branches of the wings of the mouth arms extending alternately in opposite directions. The mouths are found only on the outer surfaces of the secondary branches of the three main divisions of the mouth arms, but these branches are so elongated laterally as to cover the bare spaces between the branches and present in all directions a surface composed of fringed mouth openings interspersed with filaments. The capitate tentacles fringing the mouths are very numerous and heavily loaded with nematocysts. The filaments are covered with large nematocyst warts, giving them a knobbed and knotted appearance. The filamentous axial terminal appendages are about as long as the mouth arms and very flexible. They contain a central canal, and are covered with nematocyst warts considerably smaller than those of the other filaments. The central ducts of the mouth arms join in pairs before passing into the stomach, the ducts of the two arms arising from a common interstitial pillar uniting. Each of these 4 main ducts enters the outer end of a stomach pouch. The main duct of each mouth arm gives off about 6 small branches to the mouths of the upper portion of the mouth arm. At the point of origin of the two outer arm branches it gives off 3 main branches, one to each arm branch, and continues beyond that point to the tip of the mouth arm as a small central canal giving off a few small branches to each of the three arm branches and is continued as the central canal of the terminal filament. The canals to the two outer arm branches are broad and bifurcated near their outer ends.

The stomach is cruciform in shape, the 4 lobes tapering somewhat toward the outer ends. From the outer extremity of each lobe there are given off 3 radial canals, a central rhopalar canal and an ardradial canal on either side arising from the outer

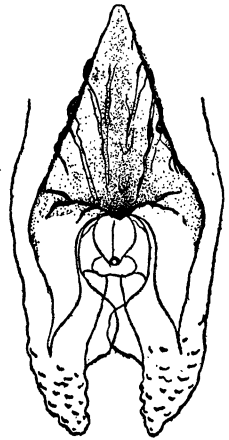


FIG. 5. *Acromitus maculosus*, an exumbrellar view of a sense organ; diagrammatic. Much enlarged.

edge of the end of the lobe. In the cleft between each two lobes, a rhopalar canal is given off. So, of the 8 rhopalar canals, the 4 perradial canals—since they arise from the ends of the stomach lobes—are short and the 4 interrarial canals—since they arise between the stomach lobes—are long. The 8 rhopalar canals extend straight to the sense organs, while the 8 interocular canals end in the circular canal. The area of the bell between the circular canal and the margin is filled with a network of anastomosing canals, taking their origin from the outer surface of the ring canal and intercommunicating with the branches of the rhopalar canals. Arising from the inner surface of the circular canal on each side of each ocular canal is a series of anastomosing canals usually 3 in number, which joins the ocular canals by a common lateral branch. This canal network has, typically, no connection with the interocular canals

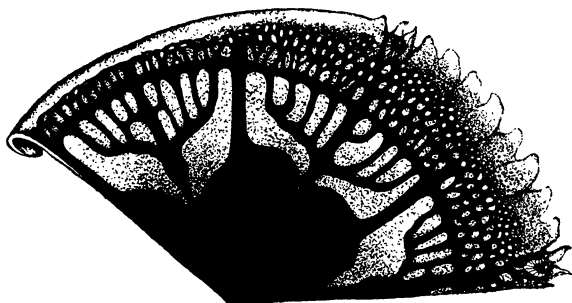


FIG. 6. *Acromitus maculosus*, an exumbrellar view of a portion of the bell, showing the canal system as seen when injected; somewhat diagrammatic.

which run directly from the stomach to the ring canal without branching or anastomosis.

There is a wide band of circular muscles covering the space between the margin and a line a little external to the level of the ends of the stomach pouches. The part of the muscle band lying within the ring canal is interrupted in the 8 rhopalar radii, while that outside the ring canal is only partially interrupted.

The whole medusa is pale blue in life, the color being deepest along the radial canals and oral arms. The exumbrella is covered with circular, ring-shaped, solid, elongated, or irregular spots. In life, these are iridescent purplish black to dark brown. In specimens preserved in formalin, the blue fades to slightly opaque white with a faint bluish tinge and the spots fade to bronze brown and finally disappear.

These medusæ were common in the shallow water along the beach at Taytay, Palawan, in April and May, 1913. Great numbers of immature forms were present the second week in May. They first appeared after a very severe wind storm of several days' duration, but were never noted in the deeper waters of the bay.

*Measurements of the type specimen in the collection of the zoölogical department of the University of the Philippines, No. C. 2081.*

	mm.
Bell diameter	90
Length of the mouth arms	60
Length of the bare proximal portion of the mouth arm	15
Diameter of the arm disk	50
Width of the inturned portion of the exumbrella	15
Diameter of the largest exumbrellar spots	5
Width of the subgenital ostia	20
Width of the interostial pillars	15

Numerous specimens of the different stages of this medusa were collected at Taytay, Palawan, in the summer of 1913 by Dr. R. P. Cowles and myself while on the joint scientific expedition of the University of the Philippines and the Bureau of Science. During the time in which they were numerous in the vicinity of Taytay, I visited neighboring islands and other parts of Palawan, but was unable to find the medusa.

Among the numerous immature specimens, some variations and abnormalities are to be noted. The time at which the spots appear on the umbrella seems to vary. Some specimens whose umbrella is but 15 mm. in diameter show distinct spots, while others which have reached a diameter of 40 mm. show no markings at all. In the immature forms, the spots are arranged in more or less circular groups of 4 or 5 which coalesce to form the large spots of the adult form. The proximal portion of the mouth arms is more prominent, and makes up a larger portion of the arms of the immature medusa. The canal system of the bell seems the same in mature and immature specimens, but the side branches of the upper portion of the main canals of the mouth arms are conspicuous in the immature forms. The canal pattern is strikingly brought out by injecting pure Delafield's hæmatoxylin through an opening in the center of the exumbrella. The only notable variation is that in a very few cases the inner canal network is connected to the adradial canals as well as to the interradianal and perradianal canals. This

connection is very slight, and is by no means common. One specimen has 5 stomach lobes, 5 gonad lobes, 9 mouth arms, 18 radial canals—10 of them rhopalar and 8 adradial—and 96 marginal lappets. There are 9 rhopalia present, and as the margin is gone at the end of another rhopalar canal we may say there are 10 rhopalia, so it is as if a new area equivalent to a quadrant has been developed in this specimen to correspond to the extra stomach lobe, lacking, however, two adradial canals. In another specimen there are 18 canals, but 5 of them—3 adradial and 2 rhopalar—arise from a single enlarged stomach pouch. Another specimen has 10 mouth arms, 4 of them developing from a single interostial pillar, but the canal system is of the normal type. At first glance, the canal system of the bell of this species appears to be very similar to that of *Catosstylus purpurus* Mayer, to which it is undoubtedly closely related. But in the injected specimens of *C. purpurus* it can be seen that the internal network of canals from the ring canal is connected most conspicuously with the adradial canals, while in *A. maculosus* it is connected with the rhopalar canals and typically not at all with the adradial canals.

I have given the species the name *maculosus*, as the spots on the umbrella constitute one of its most striking specific characters.

Genus **LOBONEMA** Mayer, 1910, emended

*Generic characters.*—*Rhizostomata triptera*, in which the velar lappets are greatly extended, tapering to pointed ends. The mouth arms show numerous filaments, and the mouth-arm membranes are perforated by windowlike openings. There are from 8 to 16 rhopalia, twice as many radial canals as rhopalia, and a ring canal which gives off an anastomosing network of vessels on both its inner and outer sides. The inner network does not connect with the stomach. All of the radial canals extend beyond the ring canal, the ocular canals always to the sense organs. The subumbrella shows a well-developed system of ring muscles extending from the mouth-arm disk to the margin, interrupted partially or not at all by the radial canals. There are numerous prominent tapering papillæ upon the exumbrella. There is an exumbrellar sensory pit above each rhopalium, whose floor is covered with radiating dendritic furrows.

This is Mayer's original definition emended so as to include *Lobonema mayeri* sp. nov.

*Lobonema mayeri* <sup>8</sup> sp. nov. (figs. 7, 8, and 9).

*Type*.—No. C. 2424, zoölogical collection, University of the Philippines.

During the middle and latter part of May, Malampaya Sound on the west coast of Palawan contained great numbers of this very beautiful and interesting medusa. Two specimens were

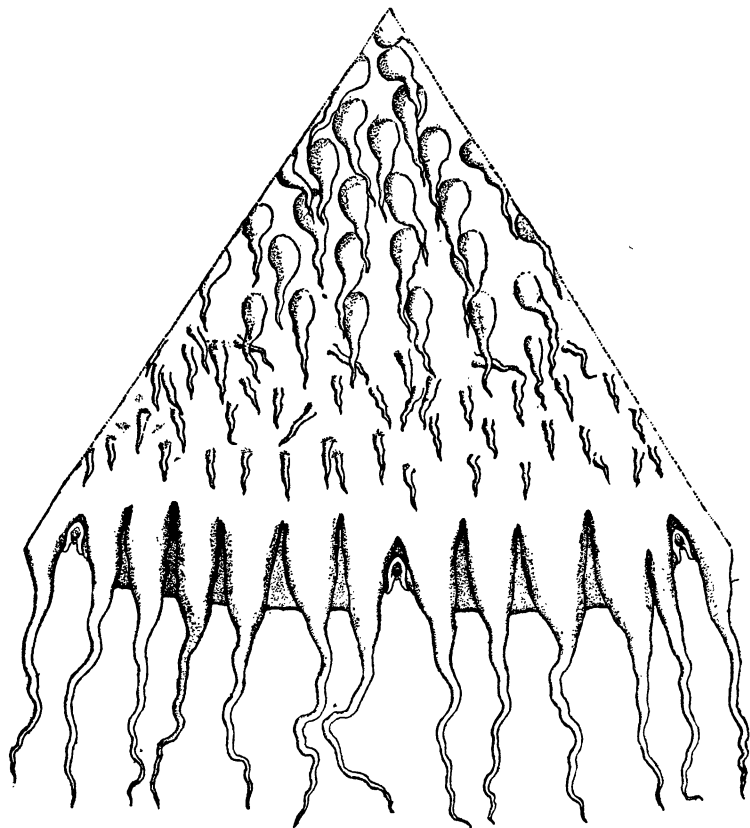


FIG. 7. *Lobonema mayeri* sp. nov., a quadrant of the exumbrellar surface, showing the papillæ, sense organs, and tentaclelike marginal lappets.  $\times 3$ .

taken in as perfect a condition as was possible in the case of forms with such long and fragile arm filaments.

The bell is much flatter than a hemisphere both in preserved and living specimens. The portion of the bell beyond the ring

<sup>8</sup> I have named this species in honor of Dr. A. G. Mayer without whose *Medusæ of the World* the completion of this report would have been extremely difficult if not impossible and who (1910) described the genus *Lobonema* and the only other known species, *L. smithii* Mayer.

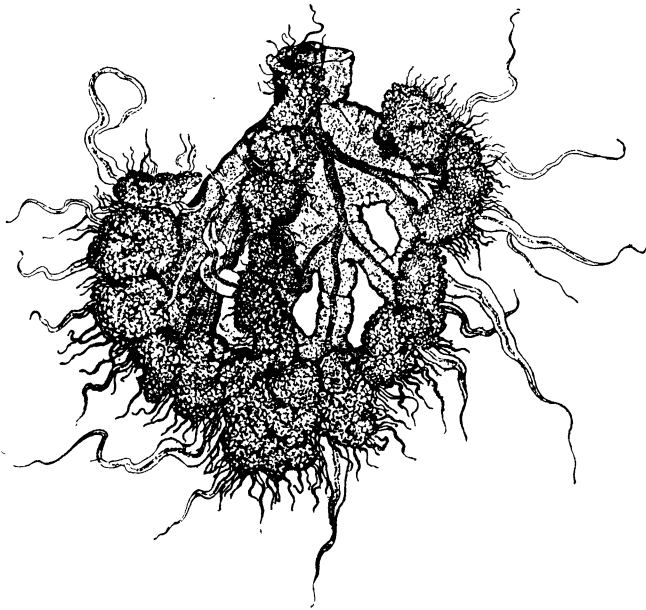


FIG. 8. *Lobonema mayeri*, a mouth arm, showing the appendages, the windowlike openings, and the irregular arrangement of the ducts; somewhat diagrammatic.  $\times \frac{1}{2}$ .

canal, which is a considerable distance from the margin, is very thin, and hangs down as a sort of fringe when floating. The bell is from 340 to 500 mm. in diameter measured from a sense club to the one  $180^\circ$  from it. Medusae having a diameter of at least 500 mm. and probably much more were very numerous. The subumbrella is covered with very flexible tapering papillæ, increasing in size and number toward the center of the exumbrella where they reach a length of 60 mm. and a basal diameter of 15 mm. Those in the center of preserved specimens are stiff and solid at the base, but their tips like the entire papillæ toward the outer position of the exumbrella are very soft, shrunken, and without rigidity. In life, they are all conical and flexible, waving about in the currents of water. Toward the center of the exumbrella, the rather broad bases of these papillæ cover the entire surface.

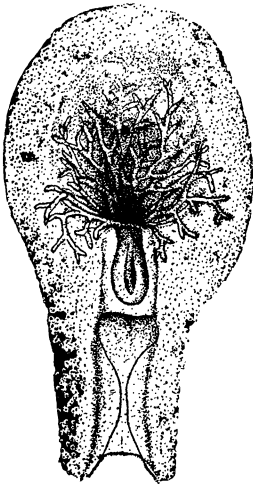


FIG. 9. *Lobonema mayeri*, a sense organ from the exumbrellar side. Much enlarged.

The 12 to 16 rhopalia are very short



with broad swollen ends, and are covered above and below by shelves of tissue, the exumbrellar shelf being very short and the subumbrellar much larger. No pigment spots are present. The exumbrellar sensory pit is small, rather deep below, and dendritically grooved. It lies in the surface of an oval, papillalike, raised area. The ocular lappets are short, plump, and closely approximated, being 4 mm. in length from the base of the exumbrellar sensory pit to the tip and 3 mm. in diameter. There are from 70 to 80 complete marginal lappets, from 3 to 6 in a paramere. Some of the lappets show a distal bifurcation. The lappets are elongated, tentaclelike, tapering to a point. They reach a length of 200 mm., measured from the inner end of the cleft, are very slender and flexible distally, and have the appearance of true tentacles. For about 25 mm. of their inner length they are joined by a web. They are concave below and convex above, with thin edges. They contain a number of large longitudinal canals joined by small lateral branches, and no muscle fibers could be detected in stained sections. The velar grooves of the exumbrella are about 25 mm. and the ocular grooves are about 12 mm. long. The rhopalar clefts are V-shaped rather than Y-shaped as in *L. smithii*. From 24 to 32 radial canals, half of them rhopalar and half interrhopalar, leave the central stomach. There are always half as many sense organs as canals. The ocular canals extend to the sense organs in the margin, but the interocular canals while extending for some distance beyond the ring canal are lost in the network of anastomosing canals before reaching the margin, differing in this character from *L. smithii*. This is well shown by injecting one of these canals with Delafield's hæmatoxylin. There is a distinct ring canal about 45 mm. inward from the sense club zone giving off an anastomosing system of canals internally and externally, which connects with both the ocular and interocular canals but not with the central stomach.

The bell between the arm disk and the ring canal is from 25 to 30 mm. in thickness, while from the ring canal to the margin it is not thicker than 10 mm. The thickest point is at the level of the ring canal, where there is a circular swollen subumbrellar area over which the radial canals curve to meet the ring canal whose greatest breadth is at right angles to the plane of the subumbrella. At this point, just before it joins the ring canal, there is a bulbous enlargement of each ocular canal.

There is no radial muscle. The circular muscles form a series of circular folds between the arm disk and the zone of the sense organs. That part of the muscle band which lies within

the ring canal is completely interrupted in the ocular radii and thinned in the interocular, while that portion lying outside the ring canal is thinned in the ocular radii and only slightly so in the interocular radii.

The arm disk is two-thirds as wide as the bell radius, very thin in the center, and swollen and rounded along the outer edge. The subgenital ostia are compressed, are twice as wide as the interostial pillars, and have a small papillalike projection in the center of their subumbrellar lip. The subgenital porticus is unitary. The gonads are in the form of long lines in the thin reduplicated and folded wall of the stomach. On each side of these lines of reproductive organs are lines of blunt gastral filaments. These reduplicated membranes are inflated and pushed out through the subgenital ostia in the two specimens in the collection. Each of the interostial pillars contains a slitlike false ostium about two-thirds as wide as the pillar. One specimen examined had a large cone-shaped papilla on the upper margin of this false ostium, while others did not.

The supporting membranes of the 3 main branches of the mouth arms are pierced by windowlike openings. Typically, there seem to be 2 in the membrane of each wing, but the weakened arm membranes have broken down in most of the arms. In no arm are there more than 2 in each wing, in some none at all, and in others the branch is only attached by its upper edge, the membrane between the openings having given away. The mouth arms are equally spaced, the two arms arising from the same interostial pillar being widely separated, the base of each extending partly over the adjacent subgenital ostium. The proximal portion of each arm is about one-half the length of the 3-winged distal portion. The fringed mouths extend on the inner surface to the center of the arm disk. Scattered among the mouths are very numerous filaments. Those of the central disk and the proximal portion of the arms are slender, threadlike filaments. Toward the distal portion they increase in length and become spindle-shaped, circular in cross section, and tapering to a long threadlike portion. The larger filaments contain an axial canal, and reach a maximum length of 200 mm. and a diameter of 10 mm.

In life, the medusa has an exquisite color scheme of purple, violet, and rose pink. The gonads are, as a rule, pink, the general color is violet, and the fringe of tentaclelike marginal lappets purple. These colors vary considerably in intensity and arrangement. In formalian, the entire medusa is milky gray and the gonads and mouth fringes are yellow.

These medusæ with their numerous tentaclelike velar lappets, their exumbrellar papillæ, and their arm appendages—all of which are very long, slender, and flexible and all of which are colored some shade between rose pink and purple—present a most striking and beautiful appearance, and as they are found on or near the surface are most conspicuous objects.

Numbers of young fish of the genus *Caranx* were found living in the mass of filaments and mouth arms.

*L. mayeri* differs from *L. smithii* in that it has from 12 to 16 rhopalia instead of 8, in that the circular muscle is completely interrupted in the ocular radii, in that it has a false ostium in each interostial pillar, and in that the interocular canals do not reach the bell margin.

I have handled this medusa and have seen and experienced the results of the sting which are very similar to those of a nettle sting and are not at all serious. This is surprising in view of the statements of Dr. H. M. Smith as given by Mayer with regard to the closely related *L. smithii* Mayer.<sup>9</sup> It seems to me much more probable that the cases of poisoning reported by Old<sup>10</sup> were due, as I have said before, to the "*Chrysaora stage*" of *Dactylometra quinquecirrha* which is common in the harbor. The Filipinos state that the latter form is very poisonous, and a number of instances are known in which it has caused severe symptoms of poisoning.

I append a table of comparative measurements and the number of rhopalia and lappets to a paramere of the two specimens of *L. mayeri* in the collection.

Measurements of *Lobonema mayeri* sp. nov.

	Specimen A.	Specimen B.
Bell diameter.....millimeters.....	350	340
Arm disk, diameter.....do.....	125	110
Maximum length of the velar lappets.....do.....	180	200
Number of rhopalia.....	12	16
Number of velar lappets.....	a 3-6	b 3-4
Width of the subgenital ostia.....millimeters.....	c 75	c 70
Width of the interostial pillars.....do.....	32	33
Width of the pillar cavity (false ostium).....do.....	25	22
Length of the mouth arms from the center of the arm disk.....do.....	180	180

a 6 in 4 parameres, 5 in 2, 4 in 5, and 3 in 1.

c More than twice the width of the pillar.

b 4 in 13 parameres and 3 in 3.

<sup>9</sup> Pub. Carnegie Inst. Wash. (1910), No. 109, 3, 690.

<sup>10</sup> This Journal, Sec. B (1908), 3, 329.

Genus **LOBONEMOIDES** novum

*Generic characters.*—*Lobonema*-like *Rhizostomata triptera* in which the marginal lappets are pointed but not greatly extended. The mouth-arm membranes are not perforated by windowlike openings. There are more than 8 rhopalia, twice as many radial canals as sense organs all extending to the margin, and a ring canal. The ring canal gives off externally a network of anastomosing canals, extending to the margin, and internally a series of anastomosing canals on each side of each rhopalar canal, which do not reach the stomach and are connected with the rhopalar canals but not the interrhopalar canals. The exumbrellar sensory pits are furrowed with radiating dendritic grooves. Each mouth arm bears numerous small scattered appendages and one large terminal spindle-shaped appendage, all of which taper to filamentous outer ends.

The type species is *L. gracilis* sp. nov. from Taytay, Palawan.

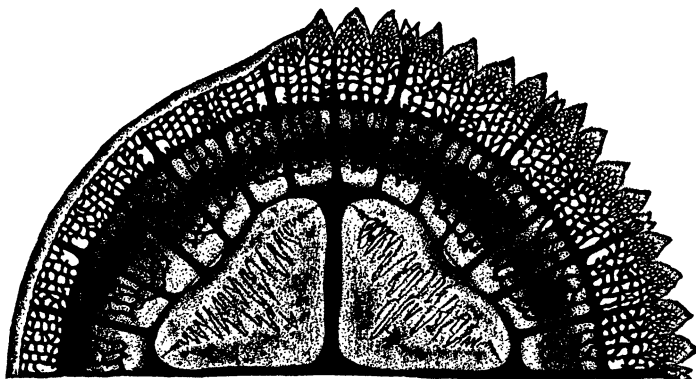


FIG. 10. *Lobonemoides gracilis*, an exumbrellar view of half the bell, showing the canal system, the marginal lappets, etc.  $\times 1$ .

*Lobonemoides gracilis* sp. nov. (figs. 10, 11, 12, and 13).

*Type.*—No. C. 2422, zoölogical collection, University of the Philippines.

The bell is flat, 50 to 85 mm. in diameter, and very transparent. The stomach and canals are semiopaque white and the gonads opaque white. That part of the bell which lies outside the ring canal is very thin and flexible, while the central portion is rather thick and stiff. This outer thin region is about 17 mm. wide in the type specimen. The bell is 7 mm. thick outside the ring canal, 14 mm. high through the outer edge of the arm disk, and 10 mm. high through the center of the arm disk. There are a few scattered papillæ on the exumbrella,

increasing in size toward the center. They are small, slender, and flexible, and reach a length of 2 mm. and a basal diameter of 0.5 mm. In preserved specimens they lie flat on the disk.

There are 14 rhopalia and twice as many radial canals, all extending to the margin. The sense organs are very short, thick clubs lying at right angles to the plane of the bell with the swollen end toward the exumbrellar surface. Between each pair of sense organs, there are 6 marginal lappets—4 large pointed triangular velar lappets between 2 small pointed ocular lappets. The rhopalar canals are somewhat larger than the interrhopalar canals, and divide distally to form a U-shaped sinus in the upper part of the ocular lappets. In the curve

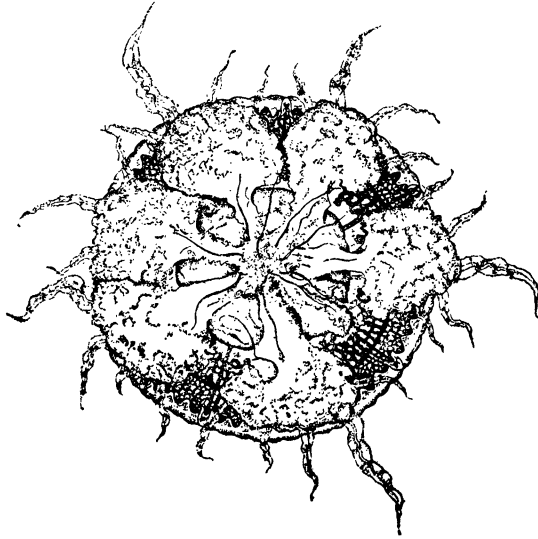


FIG. 11. *Lobonemoides gracilis* gen. et sp. nov., ventral view of the medusa.  $\times 1$ . Two of the mouth arms of this specimen are aborted.

between the limbs of this sinus lies the sense organ. The exumbrellar sensory pit is dendritically grooved. The ring canal lies at the outer edge of the swollen central region of the bell, and its greatest breadth is at right angles to the plane of the umbrella. The radial canals curve over this swollen area to the ring canal, which gives off externally and internally a set of anastomosing canals. The external network is connected in a number of places with both the ocular and interocular canals, and it approaches the latter more closely and is joined to it in a greater number of places. Internally, a network of 3 or 4 anastomosing canals is given off by the ring canal on each side of each ocular canal to which it is joined in 2 or 3

places. The interocular canals internal to the ring canal are broader than the ocular canals, and show a sinuslike broadening where they join the ring canal. Beyond the ring canal the interocular canals are small and are closely surrounded by the network of anastomosing canals, while the ocular canals maintain a uniform size to the margin and have on either side just outside the ring canal a small area free from the anastomosing canals.

The arm disk is 50 mm. in diameter, swollen in the zone of origin of the arms, and thin in the center of the disk. The subgenital ostia are 18 mm. in width and 4 mm. high, with a concave upper and swollen convex lower lip. The interstitial

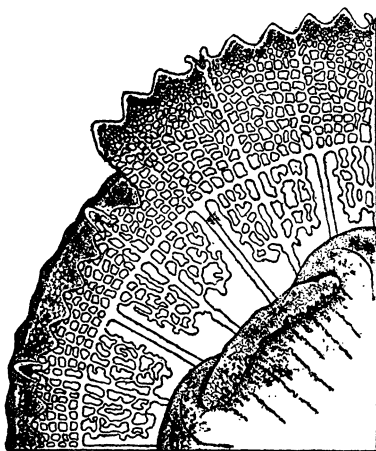


FIG. 12. *Lobonemoides gracilis*, a diagrammatic representation of a quadrant of the bell from the subumbrellar side, showing the subgenital ostium, canals, etc.  $\times 1$ .

pillars are 9 mm. wide. The subgenital porticus is unitary and square. Each gonad lies in a complex series of folds in the floor of the stomach. The folds are longest in the center and shortest at the ends, where at the level of the center of the interstitial pillars the gonads are separated from one another by a very short space. Thus the outer edges of the gonads outline a square area, the corners of which coincide with the centers of the interstitial pillars. The bases of the pillars are rounded, and the edge of the portion of the arm disk between them is straight, so the arm disk may be considered 8-sided—

rounded and straight faces alternating with one another—or more exactly 4-sided, each corner being rounded. The outline of the stomach is square, but the invaginated gonads have so encroached on it as to leave only a narrow cruciform cavity whose outer ends are joined by a marginal sinus from which the radial canals originate.

The arms are about equally spaced. The two arms on a common interstitial pillar are widely separated, so that the base of each arm lies over the outer one-third of a gonad. The arm disk at the base is a little wider than the bell radius, while at the point of origin of the arms it is only five-ninths as wide as the bell radius. The arms are 50 mm. long from

the center of the disk, and so a little longer than the bell radius. They are very flexible. The inner wings bear mouths to the center of the disk. The distal 3-winged portion of the arm is about one-half the total length of the arm. The branches are slender and delicate, and the fringed mouths are not crowded, except toward the tip of the arms. At the center of the disk is a slender filament, and around this a whorl of similar filaments, one in the axil between each pair of arms arising from a common interstitial pillar. Scattered among the mouths are a few similar but smaller filaments. At the end of each mouth

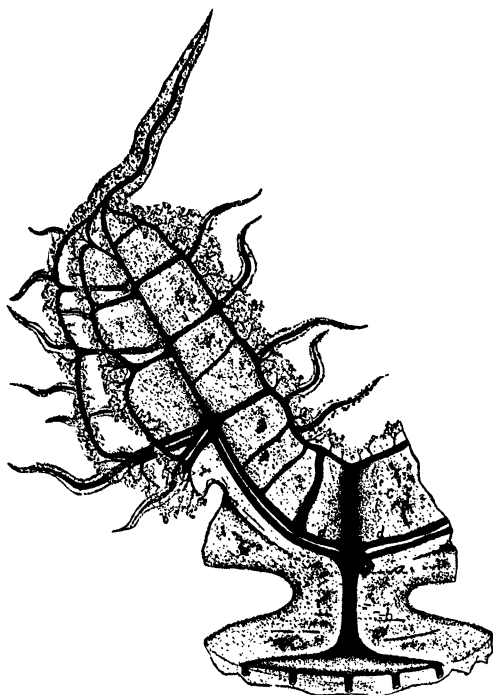


FIG. 13. *Lobonemoides gracilis*, lateral view of one mouth arm and an interstitial pillar, showing the ducts as seen in an injected specimen; diagrammatic.  $\times 1$ .

arm there is a large spindle-shaped appendage tapering to a filamentous distal end and having a central canal. Scattered on the distal ends of the arms are a few similar but smaller appendages. The terminal appendages reach a length of 45 mm. and a maximum diameter of 6 mm.

Each of the very narrow, interradian limbs of the stomach receives two ducts from the mouth arms, one (fig. 13, *a*,) at a point about one-third of the distance from its outer end to the center and the other (fig. 13, *b*,) at the outer end. These

two ducts originate from the point of junction of three main ducts in the mouth arms. The central one (fig. 13, *c*) is formed by the union of the ducts, which run along the outer edge of the inner wing of the two arms supported by a common pillar and give off smaller ducts to the branches of their inner wings. This union occurs not far from the disk center in the axil between two mouth arms supported on the same interradiar pillar. The other two (fig. 13, *d*) are the main central ducts from the same two mouth arms. Each of those two main ducts divides at the point of origin of the two outer arm wings into 3 main branches, the two larger of which run to each of the outer arm wings and join the ducts running along the outer surfaces of these wings. These and the main ducts of the arms are often double (fig. 13). The smaller one runs through the center of the arm, giving off branches to the outer ducts of the 3 wings till at the tip of the arm it and the outer ducts of the 3 wings are joined. The main duct of each arm sends off in its proximal portion one large connecting branch and numerous smaller connecting branches to the outer duct of the inner mouth arm.

The medusa is transparent white, and the gonads are yellow.

There are 3 specimens of this new and interesting medusa collected by Dr. R. P. Cowles along the beach at Taytay, Palawan. Measurements of them are given in the following table.

*Measurements of Lobonemoides gracilis sp. nov.*

Specimen.	Bell diameter.	Arm-disk diameter.	Length of the mouth arms.	Width of the sub-genital ostia.	Width of the inter-ostial pillars.
	mm.	mm.	mm.	mm.	mm.
Type C. 2422 .....	85	50	50	18	10
Cotype A .....	70	44	44	16	8
Cotype B .....	47	34	30	12	5

This is a very puzzling form to place systematically. It may possibly be a growth form of *Lobonema mayeri* or some other species of that genus, for in many ways it resembles these medusæ, but it lacks the two main generic characters of *Lobonema*, the tentaclelike marginal lappets and the perforated arm membranes. Further, it was collected on the east coast of Palawan, whereas *L. mayeri* was found only on the west coast. The gonads of *Lobonemoides gracilis* are well developed although not fully mature, and its sense organs and the arrangement of the canals of the mouth arms are different from those of *L. mayeri*.



For these reasons, I have decided to consider it as a mature form which necessitates the formation of the new genus to which I have given the name *Lobonemoides*, because of its resemblance in certain characters to Mayer's genus *Lobonema*.

The classification of a form such as this brings in question the purpose of systematic work. As I see it, the function of such work is to bring before scientific workers the forms of life in such a way as to make possible their differentiation and consequently to allow of their being placed in a general system and used as a basis for scientific inductions. The binomial system of nomenclature has been adopted as the most practical method of accomplishing this end. The placing of scientific data before the world is the essential part of such a work. The mere introducing into the literature of the group of a new generic or specific name is the smallest part and should be but a means to an end. It seems to me, therefore, that the possibility that these names may in the future become synonyms should not prevent the worker from accomplishing this purpose. For example, I might have described the above species as a doubtful, immature form of *L. mayeri*. But this denies a place in the classification and nomenclature of the group to a very interesting medusa form, which in so far as present data is concerned is a new species of a new genus and concerning which there may be no more data for years. It practically buries it from all but a very few workers; whereas, if it be given a generic and specific name it receives a place in the nomenclature of the group and is thus brought to the attention of all workers, and the question as to whether it is a mature form or not will, no doubt, be sooner settled and the medusa put in its proper place. If it be a growth form, the name which I give it will become a synonym and be discarded, but it will have accomplished the purpose for which it was given.

#### RHIZOSTOMATA LORIFERA Vanhöffen

##### Genus RHOPILEMA Haeckel, 1880

*Rhopilema visayana* sp. nov. (figs. 14, 15, and 16).

*Type*.—No. C. 2423, zoölogical collection, University of the Philippines. From Taytay Bay, Palawan.

The bell is from 200 to 400 mm. in diameter, and is hemispherical or more convex than a hemisphere. The central portion which forms the upper wall of the stomach is thick and stiff, while the remainder is very thin and flexible. The exumbrella is covered with numerous small, pointed, spinelike projections.



FIG. 14. *Rhopilema visayana* sp. nov., an exumbrellar view of a sense organ, showing the adjacent canals as seen in an injected specimen. Enlarged.

These are about 0.5 mm. in basal diameter and 0.75 mm. high. They are scattered over the surface, are about 2 mm. apart at the margin, and increase in number toward the apex, where they are only about 0.5 mm. apart. Scattered among these on the sides of the exumbrella are a few low, flatly rounded papillæ about 1.5 mm. in diameter and 0.5 mm. in height.

Each of the 8 rhopalia shows a distinct, brown, pigmented area. There are typically 8 thin, rounded, velar lappets in each octant. The free outer ends and the deep irregular grooves between them are free from the projections found on the rest of the exumbrella. The width of these lappets is variable, and their outer ends sometimes show bifurcation.

The canal system is very similar to that of *R. hispidum* Maas, the 16 radial canals extending to the margin. Each adradial canal shows a sinuslike swelling at the point of origin of its innermost and largest branch. The radial

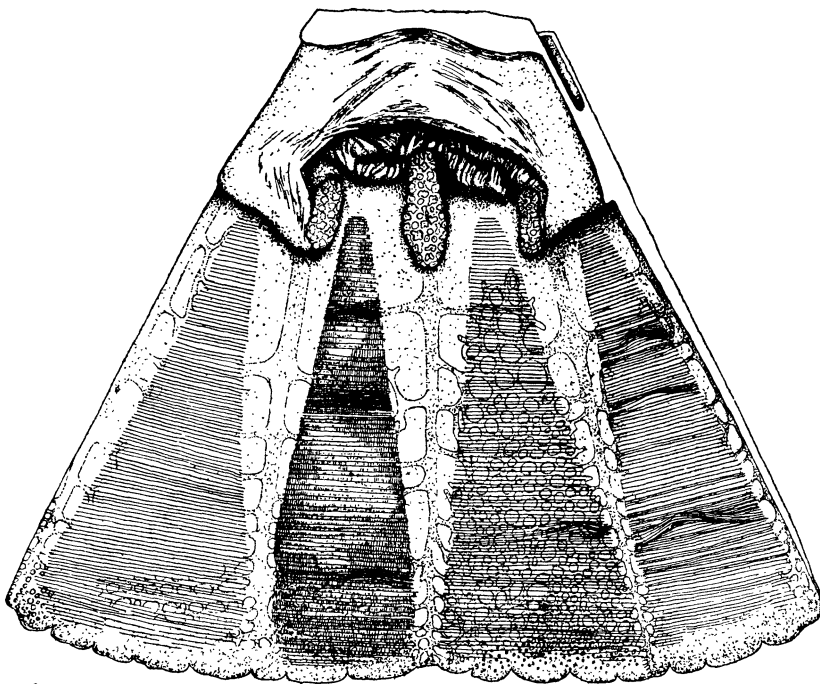


FIG. 15. *Rhopilema visayana*, subumbrellar view of a quadrant, showing the canal system, the radial muscles, and the subgenital ostium with the three papillæ.  $\times \frac{1}{2}$ .

canals divide the radial muscle into triangular areas which are widely separated proximally.

The genital ostia are as wide as the interostial pillars, and are partly closed by 1 large median papilla and 2 smaller, lateral, elongated, roughened, wartlike papillæ, each lying in the line of a radial canal. The partitions between the 4 genital cavities are narrow but complete.

The arm disk is supported by 4 broad, flat pillars. The distance from the base of one of these to the base of the one opposite it is 170 mm. The united arms arise from the center of the arm disk, and are only 60 mm. in diameter where they leave

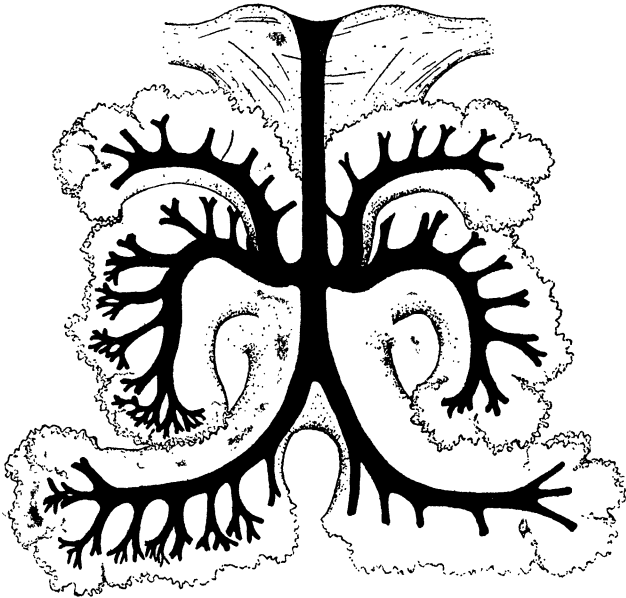


FIG. 16. *Rhopilema visayana*, a diagram of the arrangement of the ducts of two mouth arms supported by a common pillar and of their scapulets.  $\times \frac{1}{2}$ .

the disk. The mouth arms, measured from the outer surface of the arm disk, are 190 mm. in length. They are united proximally for more than two-thirds of this distance, the distal free portion measuring 75 mm. When the arms are spread out, the specimen is 200 mm. from the tip of one arm to the tip of the arm 180° from it, the central united portion being 50 mm. across at this point. The 3-winged portion of the arm makes up less than one-half of the free distal portion of the arm. Each of the two outer wings bears a dichotomously divided branch near its origin, and is divided distally into 4 flattened, tapering, nearly naked branches. Scattered among the mouths are appendages of three types: Long, flexible, somewhat flattened, filamentous append-

ages; shorter, flattened, ribbonlike appendages; and pointed, spindle-shaped or wedge-shaped appendages, the largest of which is usually terminal.

The scapulets are about 65 mm. long and 45 mm. wide at the base, their upper and outer surfaces bearing numerous mouths, among which are many long, filamentous appendages. The scapulets are branched along either side, and are deeply bifurcated at the outer end.

Each interostial pillar contains a main duct which enters the outer end of one of the 4 stomach lobes and is formed by the union of the main ducts of the 2 mouth arms arising from the same pillar. The main ducts of the 2 arms unite somewhat beyond the scapulets, and the main duct formed by their union receives on each side a duct formed by the union of the ducts of the two scapulets of that side. The main duct of each mouth arm receives a number of smaller ducts from the inner surface of the mouth arm and a very large duct from each of the 3 outer wings of the distal portion of the arm.

The color in both preserved and living specimens is opaque white.

This medusa was very common in Taytay Bay, Palawan, during May, 1913. Nearly every specimen examined contained one or more living individuals of a species of a crab, *Charibdis* (*Gonionemus*) *crucifera* (Fabr.) M. Edwards. These crabs were considerably paler than is typical for the species, which would seem to indicate a somewhat extensive residence within the medusa. I have also seen the medusa accompanied by large numbers of small fish apparently belonging to the genus *Caranx*. In some instances, these fish were seen to be eating the medusa, but in all such cases the medusa was dead. When the medusa was alive, they seemed to maintain a commensal relation. The fish would be seen playing about among the mouth arms and appendages and on being alarmed would disappear under the edge of the bell, between the arms or in the subgenital porticus. A similar condition was found in the case of *Lobonema mayeri*. I am told that *R. visayana* which is closely related to the common edible medusa of Japan, *R. esculenta* Kishinouye, is used for food by the inhabitants of the east coast of Leyte where it is preserved in vinegar. As it is apparently a common form in the Visayas (hence the name), there is no reason why it should not form a staple article of food.

It is very closely related to *R. hispidum* Maas, but differs from it in having a distinct pigmental area in the sense organ, in having its mouth arms united for more than two-thirds of their length, and in having 3 wartlike papillæ in the mouth of the subgenital ostia.

## ILLUSTRATIONS

(Drawings by Santos, Fajardo, and Peñya)

### TEXT FIGURES

- FIG. 1. *Cassiopea polypoides* Keller var. *culionensis* var. nov., a sense organ from the subumbrellar side. Much enlarged.
2. *Cassiopea medusa* sp. nov., a sense organ and the adjacent canal system from the subumbrellar side. Very much enlarged.
3. *Cassiopea medusa*, a portion of a mouth arm, showing the scattered mouths and the very typical appendages.  $\times 1$ .
4. *Acromitus maculosus* gen. et sp. nov., lateral view of the medusa.  $\times 8/9$ .
5. *Acromitus maculosus*, an exumbrellar view of a sense organ; diagrammatic. Much enlarged.
6. *Acromitus maculosus*, an exumbrellar view of a portion of the bell, showing the canal system as seen when injected; somewhat diagrammatic.
7. *Lobonema mayeri* sp. nov., a quadrant of the exumbrellar surface, showing the papillæ, sense organs, and tentaclelike marginal lappets.  $\times 1/2$ .
8. *Lobonema mayeri*, a mouth arm, showing the appendages, the windowlike openings, and the irregular arrangement of the ducts; somewhat diagrammatic.  $\times 1/3$ .
9. *Lobonema mayeri*, a sense organ from the exumbrellar side. Much enlarged.
10. *Lobonemoides gracilis*, an exumbrellar view of half the bell, showing the canal system, the marginal lappets, etc.  $\times 1$ .
11. *Lobonemoides gracilis* gen. et sp. nov., ventral view of the medusa.  $\times 1/2$ . Two of the mouth arms of this specimen are aborted.
12. *Lobonemoides gracilis*, a diagrammatic representation of a quadrant of the bell from the subumbrellar side, showing the subgenital ostium, canals, etc.  $\times 1$ .
13. *Lobonemoides gracilis*, lateral view of one mouth arm and an interstitial pillar, showing the ducts as seen in an injected specimen; diagrammatic.  $\times 1$ .
14. *Rhopilema visayana* sp. nov., an exumbrellar view of a sense organ, showing the adjacent canals as seen in an injected specimen. Enlarged.
15. *Rhopilema visayana*, subumbrellar view of a quadrant, showing the canal system, the radial muscles, and the subgenital ostium with the three papillæ.  $\times 1/2$ .
16. *Rhopilema visayana*, a diagram of the arrangement of the ducts of two mouth arms supported by a common pillar and of their scapulets.  $\times 1/2$ .



## NOTES ON PHILIPPINE ALCYONARIA

### PART II: LEMNALIOIDES KÜKENTHALI, A NEW GENUS AND SPECIES OF ALCYONARIA FROM THE PHILIPPINES AND A DISCUSSION OF THE SYSTEMATIC POSITION OF THE NEW GENUS

By S. F. LIGHT

(From the Zoölogical Laboratory, College of Liberal Arts,  
University of the Philippines)

One plate and 8 text figures

Genus **LEMNALIOIDES** novum

*Generic characters.*—The colony is upright, treelike, or bushy, and consists of a number of stems coalesced in one or more groups for some distance above the base. The tubular, non-retractile polyps are scattered singly or in little groups on the branches and lateral and terminal twigs. The spiculation of the cortex and the canal walls is similar to that in *Lemnalia*. The tentacles contain a very few, very small, scattered spicules, and the stomodæum contains no spicules. The tentacles bear more than one row of pinnules, and show a median longitudinal band of muscle fibers on their outer surfaces. The type of the genus is *Lemnalioides kükenthali* sp. nov.

*Lemnalioides kükenthali* sp. nov. (Plate I; text figs. 1 to 6).

*Type.*—This species is described from a single well-developed colony from one of the shallow reefs in Port Galera Bay, Mindoro, No. C. 254, zoölogical collection, University of the Philippines. Collected by S. F. Light in May, 1912.

The colony, which is 115 mm. in height and 110 mm. in greatest breadth across the polypary, arises from a small somewhat encrusting base, 38 mm. in length and 25 mm. in width. It consists of 2 main stalks or groups of stems which divide at a height of about 40 mm. to form a number of stems or main branches. These are divided and subdivided toward their outer ends to form a number of distally directed, closely approximated branches. On the slender, lateral and terminal twigs of these branches and scattered to some extent on the branches themselves are the large, tubular, nonretractile polyps. They arise singly or in little groups, and are all expanded in the type specimen (Plate I), where they average from 1 to 2 mm. in length and

about 0.5 mm. in diameter. The lateral twigs decrease in length from as much as 9 mm. at the base of a branch to 3 or 4 mm. toward the tip of the branch. The lines of the canal walls are distinct on the stem and branches, and each polyp can be plainly seen to be the termination of a canal.

The stomodæum is long, thick walled, and spindle-shaped,

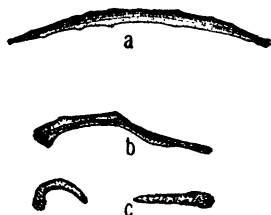


FIG. 1. Spicules from the polyp and tentacles of *Lemnalioides küken-thali*; a, a polyp spindle showing the axis to be seen in cleared specimens; b, a spindle from the distal end of one of the double rows, showing the axis and the divided and sculptured distal end; c, tentacle spicules.  $\times 112.5$ .

and contains no spicules. In an average polyp it is 0.6 mm. in length and 0.2 mm. in greatest (central) diameter. The tentacles are large with a double row of short thick pinnulæ on each side and a median band of muscle fibers on the outer surface (fig. 6). They contain only a very few, small, scattered spicules.

The polyp armature is not heavy, and consists of smooth spindles in an irregularly transverse arrangement on the body of the polyps. Distally, they form a double row of 5 or 6 pairs of spindles at the base of each tentacle (fig. 6).

The polyp spindles are rather irregular, bent, or curved, with a few low projections, and a narrow, distinct, central axis, and appear, in cleared specimens, to be more like flexible fibers than stiff spicules (fig. 1, a). They are from 0.15 to 0.20 mm. in length and from 0.005 to 0.008 mm. in diameter, and have somewhat swollen and divided ends. This is particularly true of the distal ends of the spindles of the double rows which are mushroomed and much divided and sculptured (fig. 1, b).

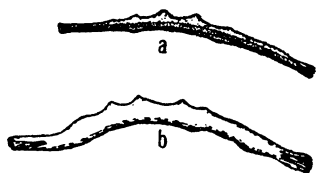


FIG. 2. Spindles from the stem cortex of *Lemnalioides küken-thali*; a, from the upper stem; b, from the mid stem.  $\times 112.5$ .

The very few tentacle spicules are irregular forms found in the crotch between two tentacles and here and there in the pinnules of the lower part of the tentacles. They range from 0.04 to 0.05 mm. in length, and are sculptured over their entire surface, particularly heavily at the outer ends (fig. 1, c).

The spicules of the stem and branch cortex are spindles. They are numerous, but do not seem to have the hard brittle character of the spicules of *Lemnalia*, as the cortex of the colony except at the base is soft and pliable. In the upper stem, these spindles are smooth and curved and are very similar to those of the polyp



but with a wider, more conspicuous axis and with slightly enlarged, divided, and roughened ends (fig. 2, *a*). Among them are a few heavier spindles, whose axes are not distinct and which show a few projections on the convex surface (fig. 2, *b*). Proximally, the spicules of the latter type increase in number and become rougher and more irregular. Some of these spindles have numerous blunt projections in zones, others have projections on the convex surface, some of them graduate into 4-rayed forms and forms approaching the double stars or capstanlike forms of so many species of *Lemnalia* (fig. 3). In the extreme base, these double stars and capstanlike forms predominate (fig. 5).

The spindles of the branch cortex reach a length of 0.15 mm. and a diameter of 0.01 mm.; those of the cortex of the upper stem are from 0.17 to 0.29 mm. in length and from 0.008 to 0.015 mm. in diameter; those of the cortex of the middle of the stem are from 0.18 to 0.3 mm. in length and from 0.009 to 0.02 mm. in diameter. The curved spindles of the cortex of the lower stem are from 0.05 to 0.19 mm. in length and from 0.019 to



FIG. 3. Spicules from the cortex of the lower part of the stem of *Lemnalioides kükenthali*.  
× 112.5.

0.036 mm. in diameter, and the club-shaped forms are from 0.08 to 0.12 mm. in length, from 0.04 to 0.05 mm. in greatest diameter, and about 0.025 mm. in least diameter. The spicules of the base are from 0.057 to 0.08 mm. in length, from 0.04 to 0.07 mm. in maximum diameter, and about 0.02 mm. in least diameter.

The spicules of the canal walls are similar in form throughout the whole colony, being smooth, rodlike bodies with roughened, expanded, and divided ends (fig. 4). These increase from an average length of 0.25 mm. and a diameter of 0.009 mm. in the branches to a length of 0.5 mm. and a diameter of 0.026 mm. in the base.

The cortex of the entire colony contains large numbers of unicellular algæ. These are particularly numerous toward the base, and give the cortex a characteristic appearance in cleared specimens when examined under the microscope.

The stem is yellowish brown and the polyp-bearing portion is light brown in formalin.

I have named the type species of the genus in honor of Prof. Dr. Willy Kükenthal, whose epoch-making work in bringing order out of chaos in the classification of the *Alcyonaria* is too well known to need recounting here.

I was pleased to see in a recent reprint (1913), which the

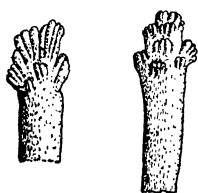


FIG. 4. The ends of two spicules from the canal walls of *Lemnalioides kükenthali*, near the base of the colony.  $\times 230$ .

author kindly sent me, that Kükenthal has come to the conclusion that the first four species, included in his revision of the Nephthyidæ (1903), in group A of the key to the species of the genus *Lithophytum* as well as *L. elegans*, *brassica*, and *armatum* belong to the genus *Lemnalia* and to a new genus *Paralemnalia* rather than to *Lithophytum*. As the classification stood before, *Lemnalia* and *Lithophytum* overlapped and neither was clearly defined. I had been forced to this conclusion by a study

of the large collection of Nephthyidæ in the museum of the University of the Philippines. It was first and most strikingly brought to my attention when separating the species into generic groups. Following Kükenthal's key to the genera of the Nephthyidæ (1903), a distinct group of species was found which seemingly belonged to *Lemnalia*, and a study of the literature of that genus confirmed me in that opinion. On studying the key to the species of *Lithophytum*, however, I found the same group of species to agree very closely with certain of the



FIG. 5. Two spicules from the cortex of the extreme base of *Lemnalioides kükenthali*.  $\times 112.5$ .

species of group A of that genus. A further study of the descriptions of the species in group A convinced me that some of them were of the same genus if not of the same species as the specimens in our collection, which after a careful study of the works of Gray (1866), Bourne (1900), and Kükenthal (1903) I concluded were, without the possibility of mistake, species of the genus *Lemnalia* Gray emend. Bourne emend. Kükenthal.

By placing the five species *africana* May, *elegans* May, *flava* May, *brassica* May, and *armatum* Kükth. in the genus *Lemnalia*, Kükenthal has put it and the genus *Lithophytum* on a clearer and more workable basis as he has clearly shown in his *Alcyonarien des Rothen Meeres*.

In this paper, Kükenthal also describes the new genus *Paralemnalia* to receive the species *thrysoides* Ehrbg. and *flabellum*

Q. and G. (including *Ammothoa digitatum* May), both previously placed by him in the genus *Lithophytum*, and a new species *P. eburnea*, thereby further clearing up the situation in the genus *Lithophytum*. He diagnoses the new genus *Paralemnalia* as follows:

Die von einer gemeinsamen Basis entspringenden glatten sehr rigiden und zerbrechlichen Hauptstämme sind nicht weiter verzweigt, höchstens können sie sich gabeln. Die Polypen sitzen direkt an diesen Hauptstämmen, und zwar stets einzeln, niemals in "Bündel," "Büschel" oder "Kätzchen" vereint, die Polypen sind retraktil, und ihr unterster Teil kann mehr oder wenig deutlich zu einem Kelch umgebildet sein. Die Kanalwände sind dünn, aber dicht erfüllt mit einem Netzwerk spindelförmiger Spicula. In ihrer Gestalt schliessen sich die Spicula der verschiedenen Regionen an die von *Lemnalia* an. Verbreitung; Indopazifischer Ozean, in flachem Wasser.

This new genus has for its type species *Ammothoa thyrsoides* Ehrbg. which Gray (1868) placed together with *Ammothoa* (*Alcyonium*) *ramosa* (Q. and G.) in his new genus *Verrilliana*. His diagnosis of this, as of so many other genera, *Lemnalia* for example, was not only incomplete but incorrect, and was ignored by subsequent workers. In the case of *Lemnalia*, although the description was incorrect, the species described, including the type species (that is, the first one named, as no type was designated), did belong to a distinct genus, and Bourne when he revised the genus retained Gray's name, *Lemnalia*. In the case of *Verrilliana*, however, of the two species named as belonging to the genus, *Ammothoa ramosa* was given first and is, therefore, since no type was named, the type species of the genus. This form, however, is undoubtedly a species of the older genus *Ammothoa* (now *Lithophytum*), and thus the name *Verrilliana*, the type species having been removed or rather returned to another genus, becomes a homonym. This, together with the very poor diagnosis, would seem to afford ample reason for dropping the name *Verrilliana*.

Kükenthal speaking of this point says:

Est ist mir daher ganz unmöglich, den namen *Verrilliana* für die von mir aufgestellte Gattung wieder zu verwenden, um so mehr als Gray ausser der *A. thyrsoides* auch noch das *Lithophytum arboreum* (Q. and G.) zu seiner neuen Gattung rechnete.

Beide Arten haben aber nicht das geringste miteinander zu tun, \* \* \*.

He evidently refers here to *Alcyonium ramosa* of Quoy and Gaimard, which Gray gave as the first species of his genus *Verrilliana*, as I find no references to *Lithophytum arboreum* (Q. and G.), and *Lithophytum arboreum*, the type species of the genus *Lithophytum*, was named by Forskål. In either case, Kükenthal is eminently correct in finding no resemblance be-

tween such forms as *Paralemnalia thyrsoidea* and such characteristic Lithophyta as *L. ramosa* and *L. arboreum*.

Our collection contains a number of specimens of the type species of this genus, *Paralemnalia thyrsoidea* (Ehrbg.) Kükenthal. They are from three rather widely separated regions: Bantayan Islands; Sabong (near Port Galera Bay), Mindoro; and Batas Island on the east coast of Palawan. I found it especially abundant on the reefs of the Sulu Sea side of Palawan, where it was one of the common reef Alcyonaria. The spreading colonies with their stiff upright stems reach a diameter of more than a meter, and are usually found associated with Alcyonidæ to which they have a superficial resemblance. It is one of the most beautiful of the Philippine reef Alcyonaria. The expanded colony has in life a soft velvety appearance, owing to the long flexible polyps which reach a length of from 10 to 15 millimeters.

An examination of the stomodæal walls of these specimens has demonstrated the presence of numerous spicules (fig. 8) somewhat similar to those found in the stomodæal walls of *Lemnalia* (fig. 7).

Judging from May's description and drawings (1899) and from a study of a large collection of *Lemnalia* in our museum, I suspect that *Ammothea digitatum* May which Kükenthal has included with *L. flabellum* as *Paralemnalia flabellum* is a species of *Lemnalia* rather than of *Paralemnalia* or at least an intergrading form. A reference to May's figures (1899) of *Ammothea digitata* will show that the stems are branched. The diagnosis is further based on the retractility of the polyps and their arrangement singly on the stems. These characters must be used with caution as it is very difficult to differentiate between extreme contractility and retractility of polyps. A number of species of *Lemnalia* in our collection have polyps which are scattered singly on the stems and twigs and which are so strongly contractile as scarcely to show above the surface and yet they are unmistakably species of *Lemnalia*.

*Paralemnalia*, however, as may be easily seen by a comparison of the type species, *P. thyrsoidea*, with any species of *Lemnalia*, is a distinct genus related to *Lemnalia* and *Lemnalioides*. It forms with these two a series of closely related genera of which *Lemnalioides* is most nearly related and *Paralemnalia* least nearly related to the genus *Lithophytum*. The method of branching, the form of the colony, the arrangement of the polyps, and the proportion between the barren and polyp-bearing portions of the colony are similar in *Lemnalia* and *Lemnalioides*, but different from that in *Paralemnalia*. *Lemnalia* and *Paralemnalia*, on the

other hand, have the characteristic stomodæum spicules which are not found in *Lemnalioides*. The tentacle spicules also, which are numerous in *Paralemnalia* and *Lemnalia*, are very few and scattered in *Lemnalioides*, and may very probably be found to be entirely absent in species as yet undiscovered.

In 1896 Kükenthal described and figured *Ammonothea carnososa*, a new species from Ternate. In his revision of the *Nephthyidæ* (1903), he includes this species in group A of his key to the species of the genus *Lithophytum*, where its characters would naturally place it as the group was at that time defined. Since that time, two of the five species in this group, *L. flavum* and *L. africanum*, have been removed (Kükenthal, 1913) to the genus *Lemnalia* and two others, *L. thrysoides* and *L. flabellum*, to Kükenthal's new genus *Paralemnalia*. This leaves *L. carnosum* as the only member of group A remaining in the genus *Lithophytum*, and this in spite of the fact that Kükenthal says (1903) :

Vorliegende Art bildet zusammen mit *L. africanum*, *flavum* und *digitatum* eine natürliche Gruppe innerhalb der Gattung *Lithophytum*.

The excellent figures and description of *A. carnososa* show it to have characteristics which suggest a relationship to *Lemnalia*, *Paralemnalia*, and *Lemnalioides*. The small polyp-bearing area restricted to the anterior portion of the colony; the colony consisting of a number of stems united for a part of their length; and the typical form and size of the spicules, their arrangement on the polyps, and their presence (supposedly in considerable numbers) in the canal walls are all characters which suggest relationship to these genera. The absence of stomodæum spicules and the absence (or apparent absence) of tentacle spicules prevent *A. carnososa* from being included in the genus *Lemnalia*, and this character together with the branching colony exclude it from the genus *Paralemnalia*. But the presence of very few tentacle spicules and, possibly, as only one form has been examined, their entire absence is characteristic of the genus *Lemnalioides*. The form of its cortex and canal-wall spicules, and also their size and arrangement, are strikingly suggestive of *Lemnalioides kükenthali*. It seems probable then that a re-examination of the type in the light of the recent changes in the genus *Lithophytum* would show *Lithophytum carnosum* (Kükth.) to belong to the genus *Lemnalioides* proposed in this paper or to be a form connecting that genus with *Lithophytum*.

While in many ways the genus *Lemnalioides*, as the name indicates, approaches the genus *Lemnalia* to which it is undoubtedly closely related as I have shown above, the differences

seem to me to be of generic value. In my study of a large collection of *Lemnalia* in which *Lemnalioides kükenthali* was at first included, I found that the differences between it and any species of *Lemnalia* in the collection were so much greater than the differences between the most widely different species of *Lemnalia* that it seemed impossible to place it with them in that genus. With the addition of the five species transferred from *Lithophytum* and the new Philippine species, the genus *Lemnalia* will contain some 20 or more species. As further collections in the Philippines and elsewhere will undoubtedly add to this number and as these species are closely related and very difficult to differentiate from descriptions without specimens for comparison, the separation from the genus of any natural group seems to be amply justified.



FIG. 6. Two tentacles from a cleared specimen of *Lemnalioides kükenthali*, showing the median muscle bands, the double rows of pinnules, and the double rows of polyp spicules.  $\times 48.5$ .

The Philippine species of *Lemnalia* all show on dissection more or less numerous, characteristic spicules in the walls of the stomodæum (fig. 7). I have found no references to such spicules in any species of *Nephthyidæ* except *Gersemnia studer* (Koch). Gray (1866), Bourne (1900), and Kükenthal (1903 and 1913) evidently overlooked these spicules, and I have no doubt that a re-examination of the type specimens would show them to be present in all the known species of *Lemnalia*. This oversight is not to be wondered at as these spicules are very seldom to be seen unless the stomodæum is dissected away from the rest of the polyp and would not be discovered except by accident or by a more thorough morphological investigation than is usually undertaken in purely systematic work. They would probably escape detection in a histological investigation, also, such as that made by Bourne (1900) as the material must be decalcified before sectioning. I found dissection under the binocular microscope of specimens cleared in clove oil to be the best method of separating the stomodæum and studying the spicules of its walls. I have examined the stomodæal walls of several of the species of *Lithophytum*, *Nephthya*, *Dendronephthya*, *Stereonephthya*, *Capnella*, and *Siphonogorgia* in our collection, but find the stomodæum to be without spicules of any kind. In *Paralemnalia thrysoides*, however, as I have mentioned above, I found stomodæal spicules to be abundant.

In all the Philippine species of *Lemnalia*, there is a single row of pinnules on each side of the tentacle. Bourne (1900) notes

the same condition in *L. nitida* (Verrill), and judging from the figures of Bourne (1900), May (1899), and Kükenthal (1903) the same is probably true of all the previously described species.

All the species of *Lemnalia* described by Bourne, Kükenthal's *L. umbellata*, and the Philippine species have numerous tentacle spicules. There are no tentacle spicules mentioned in the descriptions of May's species, but I have no doubt that, as in the case of the stomodæal spicules, a reëxamination of the type would show them to be present.

Kükenthal (1913) has emended his earlier diagnosis of *Lemnalia* (1903) to read:

Von einer gemeinsamen, oft stark verbreiterten Basis erheben sich ein oder mehrere äusserlich glatte, wenig biegsame Hauptstämme, die sich an ihrem oberen Ende in verschiedener Weise verzweigen und an ihren Endzweigen in Bündeln oder Büscheln aber niemals in "Kätzchen" angeordnete

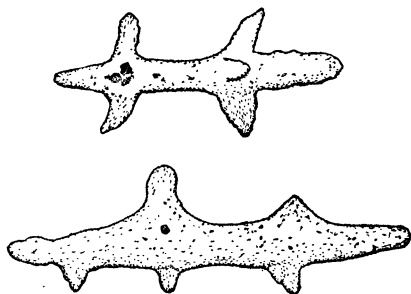


FIG. 7. Two spicules from the stomodæal walls of an undescribed species of *Lemnalia*.  $\times 1,000$ . Actual lengths, 0.038 and 0.0532 mm., respectively.



FIG. 8. A spicule from the stomodæal walls of *Paralemnalia thrysoides* (Ehrbg.) Kükenthal.  $\times 1,000$ . Actual length 0.0513 mm.

Polypen tragen. Die Polypen sind nicht retraktil. Die Kanalwände sind dünn, aber dicht erfüllt mit einem Netzwerk spindelförmiger Spicula. An der Polypenwand finden sich neben grösseren, schlanken, bedornten Spindeln kleinere vor, bei denen die Dornen in ein Paar Kränzen angeordnet sind. Die Tentakel enthalten plattenförmige, fein skulpturierte Spicula. In der Rinde der Äste liegt ein dichtes Netz schlanker, meist gekrümmter Spindeln, die nach der Basis zu mit kleineren, mehr sternförmigen Spicula untermischt werden. Verbreitung; Indopazifischer Ozean, in flachem Wasser, auf Korallenriffen.

I have found no small spicules in the polyp walls having two zones of projections as spoken of in the above diagnosis ("schlanken, bedornten Spindeln kleinere vor, bei denen die Dornen in ein Paar Kränzen angeordnet sind.") I have found such spicules, however, in the stomodæal walls of all the specimens I have studied, and I have also found them in very small numbers in the oral surface of a few species, and they are present in

large numbers in the tentacles of two species. It seems very probable that the spicules here referred to are the stomodæal spicules which may sometimes be made out through the polyp walls of cleared specimens.

I propose still further to emend the diagnosis of the genus *Lemnalia* to read as follows:

Genus **LEMNALIA** Gray emended

*Generic characters.*—The colony is upright, stiff, or rigid, and consists of one or more stems arising from a common often broadened base. The stems may or may not be coalesced proximally in one or more groups for a portion of their length. They divide distally to form numerous branches and twigs. The polyps are not retractile, but may be so strongly contracted as to appear retractile. They are scattered singly, or in little groups, on the branches and lateral and terminal twigs. The tentacles bear on each side a single row of pinnules. The thin canal walls contain a close network of spindle-shaped or rod-shaped spicules whose ends are usually roughened, enlarged, and divided. The spicules of the polyp wall are spindles usually forming 8, more or less, distinct converging double rows in the bases of the tentacles; those of the branch cortex are spindles forming an interlacing felt work over the surface; those of the stem form a thick layer of spindles, club-shaped forms, 4-rayed forms, and double stars, the last predominating toward the base. The tentacles contain numerous spicules which may be of three types, curved or rod-shaped forms, finely sculptured flattened sclerites, or slender, irregularly branched, rod-shaped spicules. The walls of the stomodæum contain small, sculptured or unsculptured, rod-shaped or flattened, irregularly branched spicules, usually having two zones of projection and often showing bifurcation of one or both ends.

*Lemnalioides* it will be seen differs from *Lemnalia* as thus diagnosed, in that the tentacles contain very few spicules, in that the stomodæum contains no spicules, and in that there is a double row of pinnules along each side of the tentacles. Two other characters which may prove to be specific rather than generic in value are the presence in the mid line of the outer surface of each tentacle of a longitudinal band of muscle fibers and the presence in the ectoderm of *Lemnalioides* of little batteries of nematocysts which I have as yet been unable to find in any species of *Lemnalia*.

*Lemnalioides* differs from *Paralemnalia* most distinctly in its softer consistency, in its more treelike colony form, in that



the polyps are sometimes arranged in little groups and are borne on the branches and twigs, in the absence of stomodæal spicules, and in the scarcity of spicules in the tentacles.

Because of these differences, I consider *Lemnalioides* a natural genus between *Lemnalia* and *Lithophytum*. It approaches *Lithophytum* in that the tentacle spicules are few and scattered and in the absence of stomodæal spicules. It further approaches it in its softer consistency and more treelike colony form. It is much more closely related to *Lemnalia*, however, which it resembles in its colony formed of proximally coalesced stems, in that the polyp-bearing portion of the colony is confined to a small distal portion of the colony, in its mode of branching, and very strikingly in the spiculation of the canal walls and cortex.

A further characteristic of *Lemnalioides* which separates it together with *Lemnalia* and *Paralemnalia* from *Lithophytum* as from all other nephthyid genera is the presence of very numerous long, sticky, elastic mesenterial filaments, extending to the base of the colony. This would seem to be a character which, together with the very characteristic form, size, and arrangement of the spicules of the canal walls and cortex and the presence of distinct polyp-bearing and barren portions of the stem with the preponderance of the barren portion, might justify the separation of the three genera *Paralemnalia*, *Lemnalia*, and *Lemnalioides* as a sub-family, Lemnaliinæ, within the family Nephthyidæ.

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## ILLUSTRATIONS

PLATE I. *Lemnalioides kükenthali* gen. et sp. nov. The colony, natural size.  
(Photograph by Cortes)

### TEXT FIGURES

(From camera lucida outlines)

- FIG. 1. Spicules from the polyp and tentacles of *L. kükenthali*; *a*, a polyp spindle showing the axis to be seen in cleared specimens; *b*, a spindle from the distal end of one of the double rows, showing the axis and the divided and sculptured distal end; *c*, tentacle spicules.  $\times 112.5$ .
2. Spindles from the stem cortex of *L. kükenthali*; *a*, from the upper stem; *b*, from the mid stem.  $\times 112.5$ .
3. Spicules from the cortex of the lower part of the stem of *L. kükenthali*.  $\times 112.5$ .
4. The ends of two spicules from the canal walls of *L. kükenthali*, near the base of the colony.  $\times 230$ .
5. Two spicules from the cortex of the extreme base of *L. kükenthali*.  $\times 112.5$ .
6. Two tentacles from a cleared specimen of *L. kükenthali*, showing the median muscle bands, the double rows of pinnules, and the double rows of polyp spicules.  $\times 48.5$ .
7. Two spicules from the stomodæal walls of an undescribed species of *Lemnalia*.  $\times 1,000$ . Actual lengths, 0.038 and 0.0532 mm., respectively.
8. A spicule from the stomodæal walls of *Paralemnalia thrysoides* (Ehrbg.) Kükenthal.  $\times 1,000$ . Actual length, 0.0513 mm.





PLATE I. LEMNALIOIDES KÜKENTHALI GEN. ET SP. NOV. THE COLONY,  
NATURAL SIZE.



NOTES ON JAPANESE LEPIDOPTERA AND THEIR  
LARVÆ: PART I

By A. E. WILEMAN

(*Manila, P. I.*)

Three colored plates

RHOPALOCERA

While residing in Japan, I took a keen interest in the varied and curious forms of lepidopterous larvæ met with, an interest further stimulated by the perusal of works such as those of Owen Wilson and of Buckler.

With the exception of Nawa, Nagano, Matsumura, Miyake, and Sasaki, who have published articles in the *Insect World* (*Konchū Sekai*) and in other periodicals, few Japanese authors have devoted much attention to describing and figuring the larvæ of Japanese Lepidoptera which are comparatively unknown to science, and I felt that a wide and almost inexhaustible field of labor existed in this particular branch of entomological research. Therefore, I decided to figure the most interesting larvæ met with in my collecting rambles which have extended to many parts of Japan. As I was unable to make drawings of these specimens, I engaged the services of a Japanese artist, Hisashi Kaidō, in order that they might be accurately represented. In the course of two years, 1901 and 1902, while residing at Kobe and Hakodate, I accumulated 200 colored drawings, some of which will be used to illustrate this series of articles.

Hisashi Kaidō, at the time that I engaged him, had no experience in figuring larvæ, but I think the general results he has attained are very satisfactory.

Apart from the pleasure which the enthusiastic lepidopterist feels in being able to identify any curious larva he may meet by referring to the plates of special works and to descriptions and figures of the various stages of butterflies and moths, he may render much valuable assistance to the specialist in classifying species, and for this reason all individual efforts are welcome in a field where the harvest is great but the laborers are few.

For the scientific classification of Rhopalocera and Heterocera not only a knowledge of structure, such as wing venation and

the genitalia, is necessary, but also a knowledge of the ova, larva, and pupa is required; and this is gained by tracing the life history of a species. In this respect I regret to say that my paper is incomplete as I have been unable to work out the life history of each species recorded. My aim has been merely to figure as many species of larvæ as I could collect and to accompany these figures with brief descriptions which have been taken from the original drawings by Hisashi Kaidō—not from the living pupa and larva. In describing larvæ, I have taken the head as the first segment.

As this paper is written with the thought of its aiding Japanese and other lepidopterists who may be working upon Japanese species, I have made a special point of quoting in the synonymy references to the works of Japanese authors. In some cases, the larvæ figured by me have also been previously figured either in colors, or in black and white, by Nawa and Nagano at Gifu.<sup>1</sup>

A most interesting characteristic of many lepidopterous larvæ, especially among the Heterocera, is their adaptability for harmonizing in color with their environment so closely that it is difficult to detect them. This is termed protective resemblance and may be special or general. Poulton,<sup>2</sup> has written at great length on this subject, and gives a table by which the colors of animals are classified according to their uses. As I shall have occasion to refer to this table when commenting upon the protective resemblance of certain larvæ figured, more especially with reference to species of Heterocera, I reproduce the data here as Table I with the consent of the publishers.

In order to obviate confusion I will say that Tokio, or Tokyo, the capital of the Japanese Empire, which in Japanese is called Dai Nihon Teikoku, is situated on an island equally well-known

<sup>1</sup> *Insect World (Konchū Sekai)* (1897–1913), 1–16. Other Japanese authors to whom I have referred in the course of this paper are the following:

Matsumura, *Catalogus Insectorum Japonicum (sic.)* (1905), 1 (no plates); and *Nihon Senchū Dzukai* (Thousand Insects of Japan) (1907), 4; (1909), supplement 1; (1910), supplement 2; (1911), supplement 3; all of these deal with Japanese Lepidoptera in the Japanese language, accompanied by many uncolored plates.

Miyajima, *Nihon Chōrui Dzusetsu* (Japanese Butterflies) (1904), with many colored plates.

Various details occurring in these works concerning the larvæ of the species figured by me and their food plants, the times of appearance, and geographical distribution of the imago have been incorporated in my notes.

<sup>2</sup> *The Colours of Animals*. 2d ed. London, Kegan Paul, Trench, Trübner & Co. Ltd. (1890), i—xiii+1—360.



# **Oversized Foldout**

by any one of the three names of Hondo, Honto, or Honshu. Dai Nihon Teikoku is translated as the Japanese Empire or Great Japanese Empire, in the same way as the British Isles are known as Great Britain.

Matsumura<sup>3</sup> calls the island on which the capital is situated Honto, and later<sup>4</sup> he calls it Honshu. For the sake of uniformity, I have adopted the name he uses in his latest work. Yezo he calls Hokkaido, as the name Yezo is but little used by modern Japanese. There will be no confusion with regard to the two large islands of Kyushu and Shikoku which are only known by these names.

The following are the names, given in their geographical order, of the chain of most important islands under Japanese rule, extending from Saghalien to Formosa.

Karafu-tō (Saghalien), southern portion only Japanese.

Chishima-tō (Kurile Islands).

Hokkaido (Yezo).

Hondo, Honto, or Honshu, on which the capital, Tokyo, and the ports of Yokohama and Kobe are situated.

Shikoku.

Kyushu (Kiushiu).

Tanegashima.

Yakushima.

Shichi-tō (Linschoten Islands or Cecilia Archipelago).

Ryukyu-tō (Loochoo Islands), consisting of the Hokubu-tō (northern group), Chubu-tō (central group), and Nambu-tō (southern group). The two latter groups are also known, respectively, as the Sannan and Miyako Islands.

Ogasawara-jima (Bonin Islands), to the east of Formosa.

Taiwan (Formosa).

The Japanese names of the food plants of larvæ described in this series of articles were mostly derived from my Japanese collector, Uehara Magoichi, who is now dead. He collected many of the larvæ for me, and although not a trained botanist he had a good working knowledge of Japanese flowering plants acquired during an experience of many years as a collector of Lepidoptera. I referred for the Latin names of these food plants to a book by Matsumura.<sup>5</sup> In cases of doubt, I have occasionally queried the Japanese or Latin name of the food plant.

<sup>3</sup> *Catalogus Insectorum Japonicum (sic.)* (1905).

<sup>4</sup> *Thousand Insects of Japan (Nihon Senchū Dzukai)* (1907-1911).

<sup>5</sup> *Shokubutsu Mei-i*. Enumeration of selected Scientific names of both Native and Foreign Plants with Romanized Japanese names and in many cases Chinese Characters (1906).

## RHOPALOCERA

## PAPILIONIDÆ

Genus **PAPILIO** Doubleday

*Papilio* DOUBLEDAY, Gen. Diurn. Lep. (1846), 1, 5.

**Papilio xuthus** Linnæus.

Pl. I, figs. 1-2, young larvæ; fig. 3, full-grown larva; fig. 4, food plant.  
Japanese name, *ageha*.

*Papilio xuthus* LINN., Syst. Nat. (1767), 1, 2, 751; PRYER, Rhop. Nihon. (1886), 2, Pl. 1, fig. 2 b, ♂; Tokyo Zool. Mag. [Tokyo Dōbut-sugaku Zasshi (Jap.)] (May 15, 1891), 3, No. 31, Pl. 2, fig. 1, imago, *xuthulus*; fig. 2, imago, *xuthus*; fig. 3, larva 4th stage; fig. 4, larva 5th stage; fig. 5, pupa; NAWA, Insect World [Konchū Sekai (Jap.)] (1898), 2, 6, Pl. I, transf.; LEECH, Butterfl. China, Japan, Corea (1892-1894), 2, 514; MATSUMURA, Jap. Injurious Insects [Nihon Gaichūhen (Jap.)] (1899), 108, Pl. 46, fig. 1, imago; fig. 2, larva; MIYAJIMA, Jap. Butterf. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 72, Pl. I, fig. 1, ♂; DYAR, Proc. U. S. Nat. Mus. (1905), 28, 939, fig. 4, larva; MATSUMURA, Cat. Insect Jap. (1905), 1, No. 1, 1; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 62, Pl. 63, fig. 1, ♀; Seitz's Macrolep. of the World, Faun. Pal. (1906), 1, 11, Pl. 6a; JORDAN, Seitz's Macrolep. of the World, Faun. Indo-austral. (1909), 9, 48.

*Papilio xuthulus* BREM., Bull. Acad. Petr. (1861), 3, 463 (spring form); BREM., Lep. Ost.-Sib. (1864), 4, Pl. I, fig. 2; PRYER, Rhop. Nihon (1886), Pl. I, fig. 2a; Seitz's Macrolep. of the World, Faun. Pal. (1906), 1, 11, Pl. 6a.

*Papilio xanthus* LINN., Rothsch. Nov. Zool. (1895), 2, 278; MOORE, Lep. Ind. (1903), 6, 45. (= *P. xuthus* Linn.)

The full-grown larva figured (Plate I, fig. 3) was taken in September, 1900, at Kobe, Settsu Province, on *karatachi* (*Ægle sepiaria* DC.). No record was kept of the date upon which the imago emerged from the pupa resulting from this larva, but I have bred the species on many occasions from similar larvæ taken chiefly on *Ægle sepiaria* on which it is very common; therefore, I am well acquainted with it. The *karatachi* shrub is much used in the environs of Tokyo for ornamental hedges, and is very useful for that purpose because of its spines. I have also found the larva feeding on *inu-zanshō* (*Xanthoxylon schinnifolium* S. and Z.), which is also mentioned by Pryer as a food plant. Leech,<sup>6</sup> quoting Graeser, states that the larva feeds on *Phellodendron amurense* (Japanese name, *kiwada*) in Amurland, that it is greenish black, with irregular milk-white

<sup>6</sup> Berl. ent. Zeitschr. (1888), 32, 62.

spots and bands, and that when sitting on the upper side of a leaf it resembles a bird-dropping. It is very true, as may be observed from the figures given of the young larvæ (Plate I, figs. 1 and 2), that they have this peculiar resemblance, but it only lasts up to the fourth molt, after which the larva assumes the green color which marks the last, or adult, stage. In the adult stage it closely resembles the larva of *P. demetrius* Cramer.

This is an instance where the larva is first protected during the greater part of its existence by special protective resemblance and in its last stage by general protective resemblance, both apparently of a constant nature.

Up to the fourth molt it is evidently protected against enemies by special resemblance as the appearance of a bird-dropping is copied in outline and color as a protection against enemies. In its last stage it is protected by general resemblance as its green color harmonizes with the total artistic effect of its environment; namely, the foliage of the karatachi. (Table I, 1, procryptic colors, a and b).

Matsumura also gives the orange tree, *mikan* (*Citrus nobilis* Lour.), as a food plant.

The larva of *Papilio helenus* Linn., judging from the figure of the young larva by Kershaw,<sup>7</sup> seems to enjoy a similar protective resemblance, both the young and full-grown larvæ being somewhat like those of *P. xuthus*. Nawa<sup>8</sup> gives colored figures of the metamorphoses of *P. xuthus* and of an ichneumon fly parasitic on it, and represents the larva with two yellowish osmeteria, or nuchal horns, exserted from the junction of the head and the first thoracic segment. These give off a strong odor, and probably have an intimidating effect on enemies.

In the Tokyo Zoological Magazine (Tokyo Dōbutsugaku Zasshi), there is a good uncolored plate showing the metamorphoses of *P. xuthus*, but no allusion is made to this plate in the succeeding Japanese text, and the author, therefore, cannot be named. Seitz states that

the larva is very similar to that of *P. bianor* Cramer; bright green; a grey, white-marked, transverse band on the third, fifth, and twelfth somites, a similar oblique band over the seventh and eighth segments; above the prolegs large, rounded, white spots. From June to November it is found on *Ægle sepiaria* and various fruit trees. The chrysalis is green, rarely brown; the anterior abdominal segments laterally somewhat swollen and carinate, caputal processes strongly developed; an obtuse, somewhat thorn-like process on thorax.

<sup>7</sup> Butterflies of Hongkong (1907), Pl. 4a, fig. 7.

<sup>8</sup> *Insect World* (1898), 2, 6, Pl. I.

Matsumura records *P. xuthus* from Hokkaido (Yezo), Honshu, Shikoku, and Kyushu, the Loochoo Islands (Ryukyu), Formosa, Ogasawara (Bonin Islands), Korea, China, Manchuria, and Amurland. He<sup>o</sup> also gives a short life history, accompanied by figures of the imago and larva. He says that there are three broods in the year and that it hibernates in the pupal stage. The nuchal horns of the larva are tolerably long, and the imago emerges in May or June. He refers here, no doubt, to typical *P. xuthus* which emerges in early summer. In December, 1912, I discovered its existence at an altitude of 2,800 meters (8,300 feet) in Luzon, at Pauai (Haight's Place), Benguet subprovince, where I collected 5 specimens. Semper does not record this species from the Philippines, so that it must be regarded as new to the fauna of these Islands. It is interesting to discover that it occurs so far south in the Indo-Malayan subregion at such an altitude. Jordan remarks that this mainly Palæarctic species extends southward to Upper Burma and also occurs in Formosa, the Bonin Islands, and Guam and that Fruhstorfer has based upon a single male from Formosa the subspecies *korringa*. I have myself taken *P. xuthus* in the Formosan mountains, and have observed it in the Japanese Islands from March to August and occasionally in September and October. *P. xuthulus*, which is the spring brood, appears first, coming out in March, followed in early summer by *P. xuthus*.

In Hokkaido (Yezo), in the extreme north of Japan, where the winter is long and severe, lasting until April, the spring form, *P. xuthulus*, does not emerge until June and the summer form, *P. xuthus*, follows in September, which is much later than in the southern latitudes of Japan with a warmer climate.

#### Subgenus *Cosmodesmus* Haase

*Cosmodesmus* HAASE, Bibl. Zool. Heft. (1892), 8, 15; SEITZ, Macrolep. of the World, Faun. Pal. (1906), 1, 14.

#### *Papilio* (*Cosmodesmus*) *sarpedon* Linnæus.

Pl. I, fig. 5, young larva; fig. 6, full-grown larva; fig. 7, pupa; fig. 8, food plant.

Japanese names, *aosuji-ageha* and *kuro-taimai*.

*Papilio sarpedon* LINNÆUS, Syst. Nat. (1767), 1, 2,747; MOORE, Cat. Lep. Mus. E. I. C. (1857), 1, 113, Pl. 3, fig. 8, larva; (*Dalchina*), Lep. Ind. (1903), 6, 12, Pl. 471, figs. 1, 1a-1c, larva and pupa; imago, ♂ ♀; PRYER, Rhop. Nihon (1886), 5, Pl. 1, fig. 9; Tokyo Zool. Mag. [Tokyo Dōbutsugaku Zasshi (Jap.)] (Aug. 15, 1891), 3, No. 34,

<sup>o</sup> Matsumura, Jap. Injurious Insects [Nihon Gaichūhen (Jap.)] (1899), 108, Pl. 46, fig. 1, imago; fig. 2, larva.

Pl. 5, fig. 1, ♂; fig. 2, ♀; fig. 3, larva first stage; fig. 4, larva fifth stage; fig. 5, pupa; LEECH, Butterfl. China, Japan, Corea (1892-1894), 2, 524; MACKINNON and NICÉVILLE, Journ. Bombay Nat. Hist. Soc. (1898), 11, Pl. W, figs. 26a, b, pupa; SCOTT, Austral. Lep. Mus. Austral. (1898), 2, Pl. 17; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 79, Pl. V, fig. 2, ♂; Dyar, Proc. U. S. Nat. Mus. (1905), 28, 937, fig. 1, larva; MATSUMURA, Cat. Insect. Jap. (1905), 3, No. 14; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 65, Pl. 64, fig. 1, ♀; KERSHAW, Butterfl. Hongkong (1907), 113, Pl. 13, fig. 5; SEITZ, Macrolep. of the World, Faun. Pal. (1906), 1, 15, Pl. 8c; JORDAN, Seitz's Macrolep. of the World, Faun. Indo-austral. (1909), 9, 94. *Dalchina teredon* FELDER, Verh. Zool.-bot. Ges. Wien (1864), 14, 305; MOORE (*Dalchina*), Lep. Ceyl. (1881), 1, 143, Pl. 62, figs. 1, 1a-1b, ♂ ♀, larva and pupa; MOORE (*Dalchina*), Lep. Ind. (1903), 6, 14, Pl. 472, figs. 1, 1a-1c, larva and pupa, ♂ ♀. Bomb. Nat. Hist. Soc. (1890), 5, 364. *Papilio sarpedon* DAVIDSON and AITKEN, nec Linn. (= *teredon*), Journ. Bomb. Nat. Hist. Soc. (1890), 5, 364.

The full-grown larva figured (Plate I, fig. 6) was taken in September, 1900, at Yoshino, Yamato Province, on *tabu-no-ki* (*Machilus thunbergii* S. and Z.), a species of the Lauraceæ. It pupated on September 11, 1900, and a female specimen emerged on May 1, 1901. A male specimen was bred from a similar larva on May 3, 1901. These two specimens are probably referable to *P. sarpedonides* Fruhst., but as they are not before me I am unable to say whether they should be assigned to the spring form, *P. sarpedonides*, or the summer form, *P. nipponus*. Moore describes the larva and pupa of *P. sarpedon* as follows.<sup>10</sup>

*Larva*.—"Smooth, thickened from the second to the 5th segment, and thence decreasing to the end; with two short subdorsal fleshy spines on the 4th segment, between which is a transverse pale yellow line, two shorter spines also on the second and third, and two on the anal segment; color, green, with a longitudinal posterior lateral and lower pale yellowish line."

*Pupa*.—"Conical, truncated in front; thorax produced into a lengthened obtusely pointed frontal process."

The spines on segments 2 and 3 are not well represented in my figure of the adult larva (Plate I, fig. 6).

Kershaw states that both larva and pupa are very much like those of *P. eurypilus* Linn. and that, in Hongkong, the larva feeds on citrus plants and on *Laurus camphora*.

Mackinnon and Nicéville<sup>11</sup> figure the pupa, but not having

<sup>10</sup> Lep. Ind. (1903), 6, 12, Pl. 471, figs. 1, 1a-1c, larva and pupa.

<sup>11</sup> Journ. Bombay Nat. Hist. Soc. (1898), 11, Pl. W, figs. 26 a, b, pupa.

access to the volume in which the illustration occurs I have been unable to examine their figures.

Seitz remarks <sup>12</sup> that—

the larva is green, with two pointed tubercles anteriorly and at the anus, bearing also two small points on each side of the third and fifth segments, on Aurantiaceæ. Dorsal thoracal projection of the pupa strongly acuminate.

Jordan states <sup>13</sup> that—

the young larva is black or dark green, with numerous spines, of which those on the metathorax are long and bristly; when full grown green, beneath lighter, with a pair of short spines on each of the three thoracic segments and on the last segment; on the metathorax a yellow transverse band and from the metathorax to the anal segment a yellowish stripe above the legs; on *Machilus odoratissima*, *Geijera salicifolia*, *Litsaea*, *Alseodaphne*, etc., and especially *Camphora officinalis*, where this tree has been imported. Pupa green, the thoracic horn slenderer, more pointed and straighter than in the allied species, the lateral ridges extending downwards from the horn straight, between this carina and the frontal one a very slight, somewhat curved vertical ridge.

Pryer states that the larva feeds on the young leaves of the evergreen, *Machilus thunbergii*, and that its color resembles very closely that of the young green leaves of this tree.

Butler <sup>14</sup> records *P. teredon* Feld., from Nikko, Central Japan; this is the Ceylon form of the species, and according to Moore's figure of the imago only differs from typical *P. sarpedon* in the narrower band of the forewing and in having the anal angle of secondaries more produced.

Moore describes the larva of *P. teredon* as follows:

Larva smooth, green, with a paler lower lateral line, and a dorsal band ending in a lateral tubercular spot on fourth segment; a pair of short tubercles on front and anal segment. Pupa green, with lateral and dorsal longitudinal yellowish streaks. Feeds on *Cinnamomeum* [sic].

Davidson and Aitken describe the larva of *teredon* as follows:

*Larva*.—"Very like that of *agamemnon* but prettier, being of a soft dark green, inclining to emerald and passing into a pale bluish on the last segment and the underparts."

*Pupa*.—"Easily distinguished from that of *agamemnon* by one mark, viz., the horn is not straight but curves slightly backwards."

In the Tokyo Zoological Magazine (Tokyo Dōbutsugaku Zasshi), already cited, there is a good uncolored plate showing the metamorphoses of *P. sarpedon*, but no allusion is made to

<sup>12</sup> Macrolep. of the World, Faun. Pal. (1906), 1, 15.

<sup>13</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1909), 9, 94.

<sup>14</sup> Ann. & Mag. Nat. Hist. (1881), V, 7, 133.

this plate in the succeeding Japanese text and the author, therefore, cannot be named. He gives black and white figures of the larva in its first and fifth stages, of the pupa, and of the imago.

Matsumura records *P. sarpedon* from Hokkaido (Yezo), Honshu, Shikoku, Kyushu, and Formosa. Miyajima records it also from the Loochoo Islands (Ryukyu), and states that it feeds upon *inu-gusu*. Inu-gusu as well as *shiro-gusu*, are merely other Japanese names for *tabu-no-ki*, previously referred to as the food plant on which I bred the larva; that is, *Machilus thunbergii*. The imago flies from May to September. Matsumura also gives *Machilus japonica* S. and Z. (*ao-gashi*) as a food plant.

Jordan states<sup>15</sup> that "*sarpedon* occurs from China and South Japan to the Solomon Islands in numerous geographical forms."

The forms which are geographically connected with China, Japan, and the Philippines are as follows:

*Papilio nipponus* FRUHST. (= *morius* Fruhst.), Seitz, 1, Pl. 8c (described as *sarpedon*), from Japan and the Loochoo Islands (Ryukyu).

*Papilio sarpedonides* FRUHST., f. vern., spring form from Japan.

*Papilio nipponus* is the Japanese race separated into spring and summer forms which differ in the bands of the forewing being broad in *sarpedonides* and narrower in *nipponus*.

*Papilio connectens* FRUHST., from Formosa and Loochoo Islands (Ryukyu).

*Papilio semifasciatus* HONR., from southeastern, central, and western China.

*Papilio sarpedon* LINN., typical (= *demophon* Meerb. nec. Linn.; *demophoon* Shaw; *luctatius* Fruhst.; *hagus* Fruhst.; *colus* Fruhst.); (Seitz, 9, pl. 44d); distributed from Hainan, Tonkin, and North India to the Philippines and Lombok. In the broad-banded specimens the median and submedian veins are more or less white inside the band of the forewing. In the summer specimens of the northern districts, f. aest. *melas* Fruhst. (= *demophoon* Shaw), the band is narrower and the veins are black.

#### Subgenus *Pharmacophagus* Haase

*Pharmacophagus* HAASE, Bibl. Zool. Heft (1892), 8, 15; Seitz, Macrolep. of the World, Faun. Pal. (1906), 1, 8.

*Papilio* (*Pharmacophagus*) *alcinous* Klug.

Pl. II, fig. 12, full-grown larva; fig. 13, dorsal aspect of segment; figs. 14-16, pupa.

Japanese names, *jako-ageha*, *yama-jorō*.

*Papilio alcinous* KLUG, Neue Schmett. (1836), 1, Pl. 1, figs. 1-4; PRYER, Rhop. Nihon (1886), 4, Pl. 3, fig. 3, ♀; Tokyo Zool. Mag. [Tokyo Dōbutsugaku Zasshi (Jap.)] (Aug. 15, 1891), 3, No. 34, Pl. 4, fig. 1, imago, ♂; fig. 2, imago, ♀; fig. 3, larva 5th stage; fig. 4, pupa; LEECH, Butterfl. China, Japan, Corea (1892-1894), 2, 539; DYAR, Proc. U. S. Nat. Mus. (1905), 28, 938, fig. 2, larva; MATSUMURA, Cat. Insect.

<sup>15</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1909), 9, 95.



Jap. (1905), 1, 2, No. 8; MATSUMURA, Thousand Insects of Japan [Nihon Senchū-Dzukai (Jap.)] (1907), 4, 60, Pl. 62, fig. 2, ♀; SEITZ, Macrolep. of the World, Faun. Pal. (1906), 1, 9, Pl. 2 a, ♂ ♀; 2 b, ♂ ♀, f. aest.; JORDAN, Seitz's Macrolep. of the World, Faun. Indo-austral. (June 20, 1910), 9, 33; MIYAJIMA, Jap. Butterfl. [Nihon Chō-rui Dzusetsu (Jap.)] (1904), 76, Pl. 3, fig. 2, ♀; 71 (woodcut), ova, fig. 1; larva, fig. 2; pupa, fig. 3.

The pupa figured (Plate II, figs. 14–16) was taken at Kobe, Settsu Province, Honshu, in July, 1901, and a male specimen of *P. alcinous* emerged from it, but no record was kept of the date. The larva figured (Plate II, fig. 12) was taken while it was crawling upon the ground, at the same locality, in August, 1901, and pupated, but the imago failed to emerge. The pupa taken in July, 1901, was similar in all respects to the one resulting from the larva of August, 1901, and I am satisfied that the two pupæ are of the same species. I have also compared the figures of my pupa with that shown by Miyajima.<sup>16</sup> He gives a good woodcut in which the larva, pupa, and ova of *P. alcinous* Klug are figured, together with the food plant, and states that the larva feeds upon the following plants: *Uma-no-suzukusa* (*Aristolochia debilis* S. and Z.); *ikema* (*Cynanchum caudatum* Maxim.); *kaga-imo*, scientific name unknown; *ao-tsuzura* (*Cocculus thunbergii* DC.), also known as *tsuzura-fuji*. The larva figured by him also agrees with my original figure (Plate II, fig. 12), so that, although no imago ever developed from my larva, I have no hesitation in referring it to *P. alcinous*. Nawa<sup>17</sup> also gives a black and white figure of the pupa which agrees with my figures as to form, but he does not give one of the larva. In the Tokyo Zoological Magazine [Tokyo Dōbutsugaku Zasshi (Jap.)], there is a good uncolored plate showing the metamorphoses of *P. alcinous*, but no allusion is made to this plate in the succeeding Japanese text and, therefore, the author cannot be named.

Pryer states that the larva feeds on *Cocculus thunbergii* DC., and resembles a partially ripe mulberry and that the pupa is most beautifully sculptured. The figures given (Plate II, figs. 14–16) fully bear out his description of the pupa which is yellowish in color and most delicately chiseled. Jordan describes the larva as follows:

Larva olive-brown, with numerous dark, light-edged spots; on the 6th and 7th segments a very broad red-white oblique girth, which is dorsally interrupted or strongly constricted; the tips of the tubercles reddish, the upper lateral projections of the prothorax pale red with dark tips.

<sup>16</sup> Japanese Butterflies (1904), 71.

<sup>17</sup> Insect World (Konchū Sekai) (1907), 11, 559.

Dyar<sup>18</sup> remarks that—

the larva of *Papilio alcinous* Klug is allied to the American *philenor*, and retains in the last stage the peculiar black and white coloration, resembling bird excrement, so characteristic of most all young *Papilios*.

Seitz and Jordan<sup>19</sup> give many forms of the *P. alcinous* group which is distributed from Japan to western China and Tonkin. Seitz remarks that "*P. alcinous* Klug is a black, geographically variable, *Papilio* which inhabits the Pacific district of the Palæarctic region" and that "it is almost exclusively Palæarctic, only a few forms entering the most northern districts of the Oriental Region." The forms given by them are quoted for convenience of reference, although only three of them inhabit Japan proper; the rest are mostly Chinese.

*Papilio alcinous* KLUG (Seitz, 1, 9, Pl. 2a, 2b) (= *spathatus* Butl., *hæmatostictus* Butl.), from Japan.

*Papilio nagasakii* FRUHST. (Seitz, 1, Pl. 2a, ♂ ♀; Pl. 2b, ♂ ♀, f. aest), from southern Hokkaido (Yezo), Honshu, and Kyushu.

*Papilio confusus* ROTHSC. (Seitz, 1, Pl. 2c, ♂ ♀), from China, southward to Yunnan.

*Papilio plutonius* OBERTH. (Seitz, 1, Pl. 2c, ♂ ♀), from central China and Tibet.

*Papilio dæmonius* ALPHÉR. (= *fatuus* Rothsch.), from Ta-tsien-lu, western China and Tibet.

*Papilio impediens* ROTHSC. (Seitz, 1, Pl. 3a), from Ta-tsien-lu, western China.

*Papilio menciis* FELD. (Seitz, 1, Pl. 2b, ♂ ♀), from central and southeastern China.

*Papilio bradanus* FRUHST. (= *intermedia* Oberth.) (Seitz, 9, 33), from the Sannan group (Ishigaki-Shima, Loochoo Islands).

*Papilio decora* OBERTH. ab. (Seitz, 9, 33), locality not given.

*Papilio loochooanus* ROTHSC. (Seitz, 9, Pl. 19c, ♂; r. 1, Pl. 1c, ♀, underside), from the Loochoo Islands (Ryukyu).

*Papilio mansonensis* FRUHST. (= *mausonensis* Fruhst.) (Seitz, 9, 33); from Formosa, eastern and central China (westward to Chang-yang), and Tonkin; the male is not distinguishable from the species from western China, *P. confusus*, but the female is as pale as in *P. loochooanus*.

According to Matsumura, *P. alcinous* occurs in Honshu, Shikoku, Kyushu, and the Loochoo Islands (Ryukyu); also, in Korea and China. It flies from March to September in two broods, spring and summer, both of which are figured by Seitz.

The following description of a *Papilio* larva was entered in my notebook on May 2, 1908. The larva was taken by me at Kanshirei, in southern Formosa, but unfortunately never pupated,

<sup>18</sup> Dyar, *Proc. U. S. Nat. Mus.* (1905), 28, 938, fig. 2, larva.

<sup>19</sup> Macrolep. of the World, Faun. Pal. (1906), 1, 9, and Faun. Indo-austral. (1909), 9, 33.

so that no imago emerged for identification. From its resemblance to the larva of *P. alcinous* Klug, I thought it would probably turn out to be the larva of a species closely allied to *P. alcinous* which was flying at Kanshirei at an altitude of 300 meters (1,000 feet). I captured several specimens of this species which I believe is referable to *P. febanus* Fruhst.<sup>20</sup>

*Description*.—White lateral stripe on side of segment 7 not quite meeting on the dorsum and ending in fleshy, white tubercles on dorsum; lateral, white, fleshy tubercles on segment 10 and two on dorsum of segment 10; lateral white tubercles also on segment 6, from which segment the lateral white band on the side of segment 7 commences, so that there is an oblique white band on segments 6, 7, not quite meeting on the dorsum; all other tubercles claret colored, red tipped; chocolate-colored diamond pattern mediodorsal stripe on dorsum; three rows of tubercles: subdorsal, subspiracular, and suprapedal.

A comparison of the foregoing description with my figure of the larva of Japanese *P. alcinous* (Plate II, fig. 12) shows a striking resemblance.

According to Seitz, the Japanese forms of *P. alcinous* are not taken in Formosa, and I have never taken them myself at Kanshirei, although of course they may possibly occur there. The only form of *P. alcinous* which is at present known to occur in Formosa is *P. mansonensis* Fruhst., so that if my larva described above be not that of the Japanese *P. alcinous* it may belong either to *P. febanus* Fruhst. or *P. alcinous* var. *mansonensis* Fruhst.

I may mention that Kanshirei is the Japanese pronunciation of the Chinese ideographs with which Koannania is written and that it was at Koannania that Matsumura took his type of *P. koannania* (= *febanus* Fruhst.).

## SATYRIDÆ

### Genus NEOPE Butler

*Neope* BUTLER, Ann. & Mag. Nat. Hist. (1867), III, 19, 166; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 89; FRUHST, Faun. Indo-austral. (1911), 9, 324.

*Neope goschkevitschii* Ménétries.

Pl. II, fig. 7, larva; figs. 8–9, dorsal aspect of segments; fig. 10, head; fig. 11, food plant.

Japanese name, *kimadara-hikage*.

<sup>20</sup> Seitz, Macrolep. of the World, Faun. Indo-austral. (1909), 9, 33.

*Lasiommata goschkevitschii* MÉN., Cat. Mus. Petr. (1855), 2, 121, Pl. 10, fig. 4; LEECH, Butterfl. China, Japan, Corea (1892-1893), 1, 52; NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] (August 15, 1910), 14, 418, Pl. 17, figs. 1-6, transf.; SEITZ, Macrolep. of the World, Faun. Pal. (June, 1908), 1, 90, Pl. 33c, ♂ ♀; FRUHST., Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 324.

*Lasiommata gaschkevitschii* FELDER, Wien, ent. Mon. (1862), 6, 28; PRYER, Rhop. Nihon (1889), 32, Pl. 9, fig. 11; MATSUMURA, Cat. Insect Jap. (1905), 1, 14, No. 109; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 101, Pl. 72, fig. 8, ♀; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 150, Pl. 16, fig. 8.

*Neope nipponica* BUTL., Ann. & Mag. Nat. Hist. (1881), V, 7, 133.

*Neope japonica* BUTL. Ann. & Mag. Nat. Hist. (1867), III, 19, 167.

The larva figured (Plate II, fig. 7) was taken in July, 1901, at Yoshino, Yamato Province, Honshu, on bamboo grass, *sasagusa* (? *Lophatherum elatum* Zoll.). The imago failed to emerge from the pupa resulting from this larva. Nagano gives lengthy descriptions of the metamorphoses of this species including a figure of the larva in his plate which agrees with my colored figure. I am unable to follow the written description of his larva with accuracy as it is in technical Japanese language, and have therefore depended only on his figure for identification. I think, however, that there can be no doubt that my larva is identical with that of *N. goschkevitschii*, figured by Nagano on a species of bamboo.

The following description is taken from my original figure.

*Larva*.—Length, 32 millimeters. Grayish brown with a yellow tinge; faint longitudinal mediodorsal dark lines; subdorsal dark spots and crosses; midlateral longitudinal dark line; series of dark spiracular blotches; yellowish longitudinal subspiracular stripe.

Matsumura records this species from the Hokkaido (Yezo), Honshu, Kyushu, and Shikoku, where it is very common. I have captured it in all those islands from April to August.

Fruhstorfer<sup>21</sup> remarks that "*N. goschkevitschii* reaches the farthest north and inhabits all the islands from Hokkaido (Yezo) to Formosa" and gives the following races:

*Neope japonica* Butler, described from Hakodate, Hokkaido (Yezo).

*Neope watanabei* Mats., from Formosa (Hoppon).

Fruhstorfer does not mention *N. nipponica* Butl. which was described in 1881 from Nikko, Honshu.

<sup>21</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 324.

Genus **LETHE** Hübner

*Lethe* HÜBNER, Verz. bek. Schmett. (1827), 56; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 82; FRUHST, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 321.

Subgenus **Kirrodesa** Moore

*Kirrodesa* MOORE, Lep. Ind. (1892), 1, 237.

**Lethe** (*Kirrodesa*) **sicelis** Hewitson.

Pl. II, fig. 1, larva; fig. 2, head; figs. 3-4, dorsal aspect of segments; fig. 5, pupa; fig. 6, food plant.

Japanese name, *hikage-chō*.

*Debis sicelis* HEWITSON, Exot. Butterfl. (1862), 3, Pl. 1, fig. 3.

*Lethe sicelis* PRYER, Rhop. Nihon (1889), 32, Pl. 9, fig. 10; LEECH, Butterfl. China, Japan, Corea (1892-1893), 1, 36; MATSUMURA, Cat. Insect, Jap. (1905), 1, 14, No. 113; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)], 4, 98, Pl. 72, fig. 1, ♀; SEITZ, Macrolep. of the World, Faun. Pal. (1906), 1, 84, Pl. 31b; NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] (1910), 14, 590, Pl. 24, figs. 1-12, transf.; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusetsu (Jap.)], (1904), 146, Pl. 16, fig. 3; FRUHST, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 322.

The larva figured (Plate II, fig. 1) was taken in July, 1901, at Kobe, Settsu Province, on bamboo grass, *sasa-gusa*, (? *Lophatherum elatum* Zoll.). From this an imago emerged, but no record was kept of the date of emergence nor of the sex. A second larva was taken by me, also on *sasa*, on September 9, 1900; this pupated on September 20, and emerged on September 25, 1900. The pupa figured is the pupa of the second larva. I have also taken the larva of this species on *kaya* (? *Torreya nucifera* S. and Z.), a kind of reed grass, and on *tsubana* (? *Imperata arundinacea* Cyr.), a species of grass. Two males and one female were bred by me at Kobe from the larvæ, June 7 and 8, 1901.

The following descriptions are taken from my original figures.

*Larva*.—Length, 39 millimeters. Yellowish green; green mediodorsal longitudinal stripe edged with yellow lines on each side; yellow midlateral and whitish suprapedal longitudinal stripes; horns of head pink tipped.

*Pupa*.—Light green with two rows of four white spots on the dorsum. Suspended by tail from food plant.

Pryer remarks that he took the larva of *L. sicelis* and believes that it feeds on bamboo grass. Matsumura records the species from Honshu, Shikoku, and Kyushu, but not from Hokkaido (Yezo), where it does not seem to occur. Miyajima gives its season of flight as being from July to August, but I have taken it in various localities in the islands enumerated by Matsumura

from May to September. Pryer says that it goes only a short distance up the mountains, where it is replaced by *L. diana* Butler. However, I have taken specimens up to an altitude of from 300 to 500 meters (1,000 to 1,500 feet) on the mountains of Ōmine-san and Ōdai-san in Yamato Province, Honshu. In Tosa Province, Shikoku Island, it occurs in May, and I have taken it at Nikko, Honshu, in the same month at an elevation of about 500 meters (1,500 feet).

Fruhstorfer<sup>22</sup> describes a distinct race of *L. sicelis* from Kyushu, which he names *vanelia*. It is characterized by the absence of the gray- or blue-violet bordering to the eyespots on the underside of the hind wing which is always present in examples from Hondo (Honshu) and which Hewitson and Seitz<sup>23</sup> distinctly figure.

### Subgenus Rangbia Moore

*Lethe* HÜBNER, Verz. bek. Schmett. (1827), 56; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 82.

*Rangbia* MOORE, Lep. Ind. (1890-1892), 1, 232; FRUHSTORFER, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 322.

### *Lethe* (*Rangbia*) *diana* Butler.

Pl. III, fig. 1, larva; fig. 2, head; figs. 3-4, dorsal aspect of segments; figs. 5-6, pupa; fig. 7, food plant.

Japanese name, *kuro-hikage*.

*Debis diana* BUTLER, Journ. Linn. Soc. Zool. (1866), 9, 55; PRYER, Rhop. Nihon (1889), 32, Pl. 9, fig. 12; OBERTHÜR, Étud. d'Entom. (1881), 6, 16, Pl. 7, fig. 2; LEECH, Butterfl. China, Japan, Corea (1892-1893), 1, 28; MATSUMURA, Cat. Insect Jap. (1905), 1, 14, No. 112; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 108, Pl. 73, fig. 10, ♀; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 84, Pl. 31a; FRUHSTORFER, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 322; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 147, Pl. 16, fig. 4.

*Lethe whitelyi* BUTLER, Ann. & Mag. Nat. Hist. (1867), III, 20, 403, Pl. 9, fig. 8.

*Lethe consanguis* BUTLER, Ann. & Mag. Nat. Hist. (1881), V, 7, 133.

The larva figured (Plate III, fig. 1) was taken on June 3, 1902, at Hakodate, Oshima Province, Hokkaido (Yezo), on bamboo grass, *sasa-gusa* (? *Lophatherum elatum* Zoll.). It pupated on June 15, 1902, and a female imago emerged on July 3, 1902. A male and female emerged from similar larvæ on June 27 and July 2, 1902.

The following descriptions are taken from my original figures.

<sup>22</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 322.

<sup>23</sup> Seitz's Macrolep. of the World, Faun. Pal. (1906), 1, 84, Pl. 31b.

*Larva*.—Length, 27 millimeters. Pinkish gray; dark medio-dorsal pattern; spiracles black; whitish suprapedal longitudinal line.

*Pupa*.—Bronze-brown with lighter reflections and black dots; two short white lines on the dorsum extending one-third way from tail; mediodorsal white line on dorsum extending half way from tail and continuing black; suspended by the tail from the food plant.

Matsumura records this species from Hokkaido (Yezo), Honshu, Shikoku, and Kyushu; also, from Korea and China. I have taken it from May to August, and have noticed that in Honshu and Kyushu it appears to be a mountain butterfly, while in Hokkaido it inhabits the plains. As far as I am aware, no figure or description of the larva has been published before.

Fruhstorfer<sup>24</sup> lists the following forms of *L. diana*.

*Lethe diana* Butl., described from Hakodate, Hokkaido (Yezo).

*Lethe consanguis* Butl., aberration from Nikko, Hondo (Honshu).

*Lethe celeja* Fruhst., subspecies, normal form (= figure given in Seitz, 1, Pl. 31a), from Hondo (Honshu).

*Lethe whitelyi* Butl., from Nagasaki, Kyushu.

*Lethe fixseni* Butl., subspecies from Korea.

"*Diana* is the only *Lethe* which bears a long hair tuft on the underside of the forewing, placed below the submedian."

#### Subgenus Tansima Moore

*Lethe* HÜBNER, Verz. bek. Schmett. (1827), 56; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 82.

*Tansima* MOORE, Lep. Ind. (1890-1892), 1, 271.

#### *Lethe* (*Tansima*) *marginalis* Motschulsky.

Pl. III, fig. 17, larva; fig. 18, head; fig. 19, dorsal aspect of segment; fig. 20, food plant; figs. 21-22, pupa.

Japanese name, *kuro-hikage-modoki*.

*Satyrus marginalis* MOTSCHULSKY, Étud. d'Entom. (1860), 9, 29; LEECH, Butterfl. China, Japan, Corea (1892-1893), 1, 25; SEITZ, Macrolep. of the World, Faun. Pal. (June 23, 1908), 1, 86, Pl. 31d, ♂ ♀; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusesetsu (Jap.)] (1904), 147, Pl. 16, fig. 5.

*Lasiommata maacki* BREMER, Bull. Acad. Petr. (1861), 3, 468; BREM., Lep. Ost.-Sib. (1864), 22, Pl. 3, fig. 3; MATSUMURA, Cat. Insect Jap. (1905), 1, 14, No. 111; (*Lethe*), MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 101, Pl. 72, fig. 7, ♀.

The larva figured (Plate III, fig. 17) was taken in June, 1901, at Yoshino, Yamato Province, on *susuki*, a species of grass (? *Miscanthus sinensis* Anders.), and a female imago emerged from the pupa resulting from this larva on June 23, 1901.

<sup>24</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 322.

Three males also emerged on July 6 and 11, 1901, from other larvæ taken about the same time.

The following descriptions are taken from my original figures.

*Larva*.—Length, 48 millimeters. Yellowish green; horns on head pink tinged; mediodorsal longitudinal dark green stripe; subdorsal midlateral supraspiracular longitudinal green stripes; whitish longitudinal suprapedal stripe.

*Pupa*.—Yellowish green; three darker lines on dorsum; wing cases edged with yellow. Suspended from food plant by tail.

Matsumura records the species from Hokkaido (Yezo) and Honshu and also from Formosa, Korea, China, and eastern Siberia (Ussuri and Amurland). I have taken the imago in Yamato Province, Honshu, and also in Iyo Province, Shikoku. It appears to be a mountain species except in Hokkaido, where it inhabits the plains. It flies in July and August.

#### Subgenus Harima Moore

*Lethe* HÜBNER, Verz. bek. Schmett. (1827), 56.

*Harima* MOORE, Lep. Ind. (1892), 1, 299 (type, *callipteris* Butl.).

*Sinchula* MOORE, Lep. Ind. (1892), 1, 275; FRUHSTORFER, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 313.

#### *Lethe* (*Harima*) *callipteris* Butler.

Pl. III, figs. 23–24, dorsal aspect of segments; fig. 25, head; fig. 26, larva; figs. 27–28, pupa; fig. 29, food plant.

Japanese name, *hime-kimadara-hikage*.

*Neope callipteris* BUTLER, Ann. & Mag. Nat. Hist. (1877), IV, 19, 92; PRYER, Rhop. Nihon (1889), 32, Pl. 10, fig. 2; LEECH, Butterfl. China, Japan, Corea (1892–1893), 1, 36, Pl. 6, figs. 3 ♂, 4 ♀; MIYAJIMA, Jap. Butterfl. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 148, Pl. 16, fig. 6; MATSUMURA, Cat. Insect. Jap. (1905), 1, 14, No. 110; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1907), 4, 103, Pl. 72, fig. 10, ♀; SEITZ, Macrolep. of the World, Faun. Pal. (June 23, 1908), 1, 86, Pl. 31e.

The larva figured (Plate III, fig. 26), was taken in June, 1902, at Hakodate, Oshima Province, Hokkaido (Yezo), on bamboo grass, *sasa-gusa* (? *Lophatherum elatum* Zoll.). It pupated on July 4, 1912, and a female imago emerged from the pupa resulting from it on July 19, 1902. A male emerged on August 10, 1902, from a second larva taken.

The following descriptions are taken from my original figures.

*Larva*.—Length, 35 millimeters. Bluish green; mediodorsal longitudinal green stripe edged with yellow lines; subdorsal and midlateral longitudinal yellow stripes; white suprapedal longitudinal stripe; horns of head tipped with pink.

*Pupa*.—Bluish green; four rows of white spots on dorsum and thorax. Suspended by tail from food plant.



This species appears to be confined to the Japanese Islands. Matsumura records it from Hokkaido (Yezo), Honshu, and Kyushu, and I have taken it in Kyushu. It flies from July to September.

Pryer states that it is a mountain insect. This is quite true in Honshu and Kyushu Islands, as I discovered when collecting there, but at Hakodate in Hokkaido, which is a great deal farther north, it inhabits the plains as well as the mountains, like several other species, which in the more southern parts of Japan are only found in the mountains, but which in Hokkaido occur commonly in the plains; for example, *Vanessa io* Linn. and *Lasiommata epimenides* Mén. I found *L. callipteris* especially abundant in July and August on the summit of the Raiden Tōge (Raiden Pass), in Hokkaido, at an elevation of 500 meters (1,500 feet) where the vegetation mainly consisted of bamboo grass, or sasa, the food plant of the larva.

Seitz<sup>25</sup> remarks:

*L. callipteris* has the appearance of being a small form of *labyrinthea* Leech, from central and western China in July, but the male is without the dentate bandlike scent organ found in that species. *Callipteris* has, hitherto, only been known from Japan; the specimen from which our figure is taken and which belongs to Tring Museum, England, however bears the locality "Kashmir." If that be not an error in labeling, I am inclined to regard *callipteris* Butl. and *labyrinthea* Leech, in spite of the difference in the scent organ, as being localized forms of one widely distributed species.

### Genus MYCALESIS Hübner

*Mycalesis* HÜBNER, Verz. bek. Schmett. (1827), 55; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 80; FRUHSTORFER, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 330.

### Subgenus Sadarga Moore

*Sadarga* MOORE, Tr. Ent. Soc. Lond. (1880), 157.

*Mycalesis* (*Sadarga*) *gotama* Moore.

Pl. III, fig. 8, larva; fig. 9 head; figs. 10–11, dorsal aspect of segments; fig. 12, food plant; figs. 13–14; pupa; figs. 15–16, pupa previous to emergence.

Japanese name, *hime-janome*.

*Mycalesis gotama* MOORE, Cat. Lep. E. I. C. (1857), 1, 232; PRYER, Rhop. Nihon (1889), 30, Pl. 9, fig. 1; LEECH, Butterfl. China, Japan, Corea (1892–1893), 1, 14; NAWA, Insect World [Konchū Sekai (Jap.)] (1900), 4, 373, Pl. 10, figs. transf. larva, pupa, imago, food plant; MIYAJIMA, Jap Butterfl. [Nihon Chōrui Dzusetsu (Jap.)] (1904), 145, Pl. 16, fig. 1; MATSUMURA, Cat. Insect Jap. (1905), 1, 15, No. 118; MATSUMURA, Thousand Insects of Japan [Nihon

<sup>25</sup> Macrolep. of the World, Fauna Pal. (1908), 1, 86.

Senchū Dzukai (Jap.)] (1907), 4, 99, Pl. 72, figs. 6 ♂, 2 ♀; SEITZ, Macrolep. of the World, Faun. Pal. (1908), 1, 81, Pl. 29c, ♂ ♀; FRUHSTORFER, Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 348.

*Mycalesis borealis* FELD. and ROGEN., Reise Novara (1867), 500.

The larva figured (Plate III, fig. 8) was taken in July, 1901, at Yoshino, Yamato Province, Honshu, on bamboo grass, *sasa-gusa* (? *Lophatherum elatum* Zoll.), and a female imago emerged from the pupa resulting from it on August 9, 1901.

The following descriptions are taken from my original figures.

*Larva*.—Length, 30 millimeters. Yellowish green; dark green mediodorsal longitudinal line edged with yellow; yellow subdorsal longitudinal line.

*Pupa*.—Green with two lines of four white spots on the dorsum; suspended by the tail from food plant; it is green for some time after pupation, and, as in the case of the pupæ of many other Lepidoptera, turns brown before emergence (Plate III, figs. 15 and 16). Three males and two females also emerged at later dates from similar larvæ. There is another form of the larva which, instead of being green, is a dirty grayish brown with the dorsal and subdorsal lines dark. On May 12, 1901, I found a larva of this form at Yoshino from which an imago of *gotama* emerged on May 31, 1901. The color of this larva, however, may have been due to the fact that it was preparing to pupate as the larvæ of many Lepidoptera change color before entering on the pupal stage.

Nawa<sup>26</sup> gives a black and white figure of the larva of this species, together with its transformations. Matsumura records its occurrence in Honshu, Shikoku, Kyushu, and Ryukyu (Loochoo Islands). I have taken it in Honshu, Kyushu, and Shikoku, from May to September. Miyajima records it from Hokkaido (Yezo), but I have never taken it there, and Matsumura does not record it from that island. Rice is given as its food plant by Matsumura.

Fruhstorfer<sup>27</sup> remarks:

*M. gotama*, an East Asiatic collective species, which inhabits the Japanese Islands from Hondo (Honshū) onwards, has spread from central and western China to Annam and Upper Assam.

He also gives the following subspecies, races, and forms which are referable to *M. gotama*.

*Mycalesis gotama* Moore, subspecies from Shanghai, China.

*Mycalesis borealis* Feld., subspecies from China and Japan (Nagasaki, Kyushu Island).

<sup>26</sup> *Insect World* (Konchū Sekai) (1900), 4, 373, Pl. 10.

<sup>27</sup> Seitz's Macrolep. of the World, Faun. Indo-austral. (1911), 9, 348.

*Mycalesis fulginia* Fruhst., form of *M. borealis*, from Japan (Kyushu Island).

*Mycalesis seriphus* Fruhst., Seitz, 1, Pl. 29c, from Japan, Honshu Island.

*Mycalesis madjicosa* Butler, Seitz, 9, 92 d. ♀; island race; described by Butler from Madjico-shima in Cat. Satyr. Brit. Mus. (1868), 135, Pl. 3, fig. 10. Madjico-shima (recte ? Majiko-shima) is undoubtedly a Japanese island but I have been unable to trace its geographical position; it is probably one of the Loochoo Islands; specimens are in the Fruhstorfer collection from Ōshima, one of the Loochoo Islands, and from Ishigaki-shima, which is situated in the southern or Miyako group of the Loochoo Islands (Ryukyu).

*Mycalesis nanda* Fruhst., subspecies from Tainan and Horisha in Formosa.

*Mycalesis charaka* Moore, subspecies from India, Tonkin, and Assam.

*Mycalesis oculata* Moore, dry season form, from Assam and Bhamo, Burma.

# ILLUSTRATIONS

(Drawings by Hisashi Kaidô)

## PLATE I

FIGS. 1 to 4. *Papilio xuthus* Linnæus.

1 and 2, young larvæ; 3, full-grown larva; 4, food plant.

5 to 8. *Papilio* (*Cosmodesmus*) *sarpedon* Linnæus.

5, young larva; 6, full-grown larva; 7, pupa; 8, food plant.

## PLATE II

FIGS. 1 to 6. *Lethe* (*Kirrodesa*) *sicelis* Hewitson.

1, larva; 2, head; 3 and 4, dorsal aspect of segments; 5, pupa; 6, food plant.

7 to 11. *Neope goschkevitschii* Ménétries.

7, larva; 8 and 9, dorsal aspect of segments; 10, head; 11, food plant.

12 to 16. *Papilio* (*Pharmacophagus*) *alcinous* Klug.

12, full-grown larva; 13, dorsal aspect of segment; 14 to 16, pupa.

## PLATE III

FIGS. 1 to 7. *Lethe* (*Rangbia*) *diana* Butler.

1, larva; 2, head; 3 and 4, dorsal aspect of segments; 5 and 6, pupa; 7, food plant.

8 to 16. *Mycalesis* (*Sadarga*) *gotama* Moore.

8, larva; 9, head; 10 and 11, dorsal aspect of segments; 12, food plant; 13 and 14, pupa; 15 and 16, pupa previous to emergence.

17 to 22. *Lethe* (*Tansima*) *marginalis* Motschulsky.

17, larva; 18, head; 19, dorsal aspect of segment; 20, food plant; 21 and 22, pupa.

23 to 29. *Lethe* (*Harima*) *callipteris* Butler.

23 and 24, dorsal aspect of segments; 25, head; 26, larva; 27 and 28, pupa; 29, food plant.



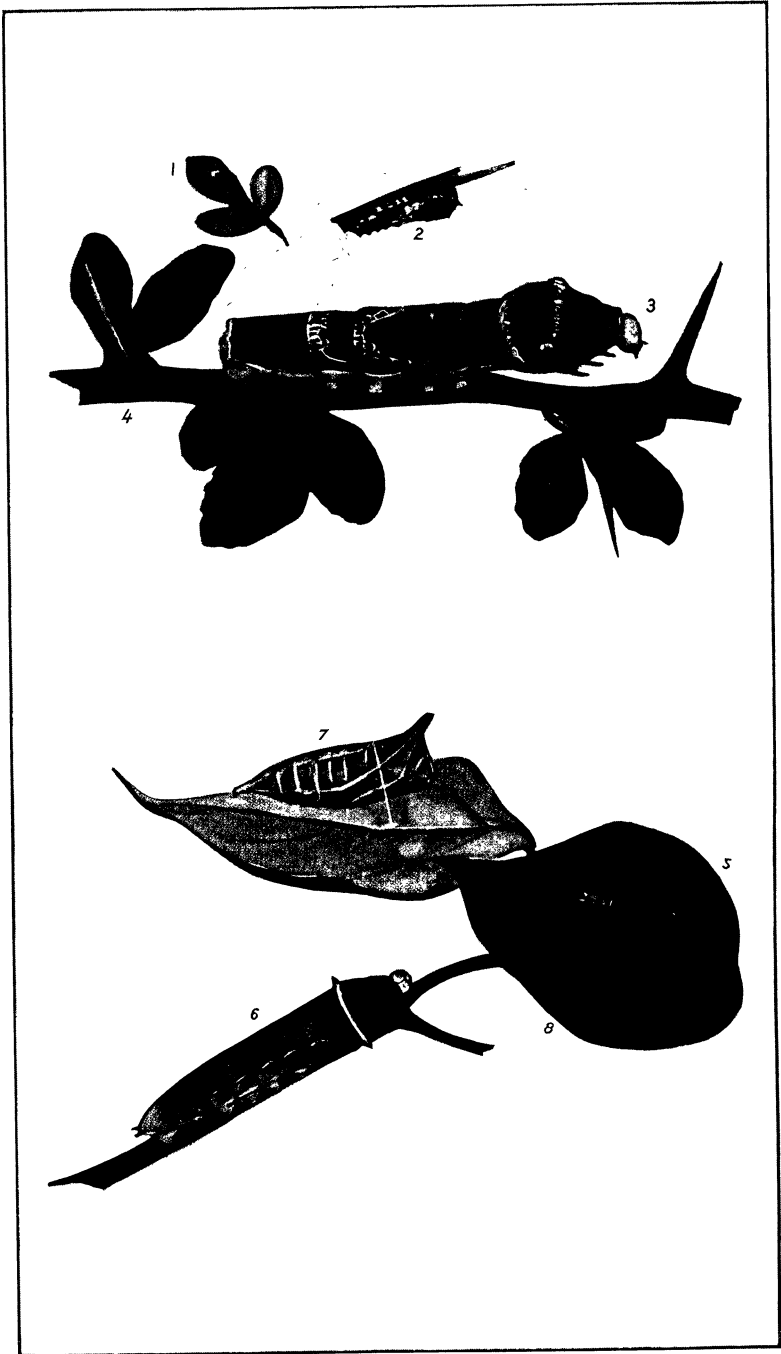


PLATE I. PAPILIO XUTHUS AND PAPILIO SARPEDON.



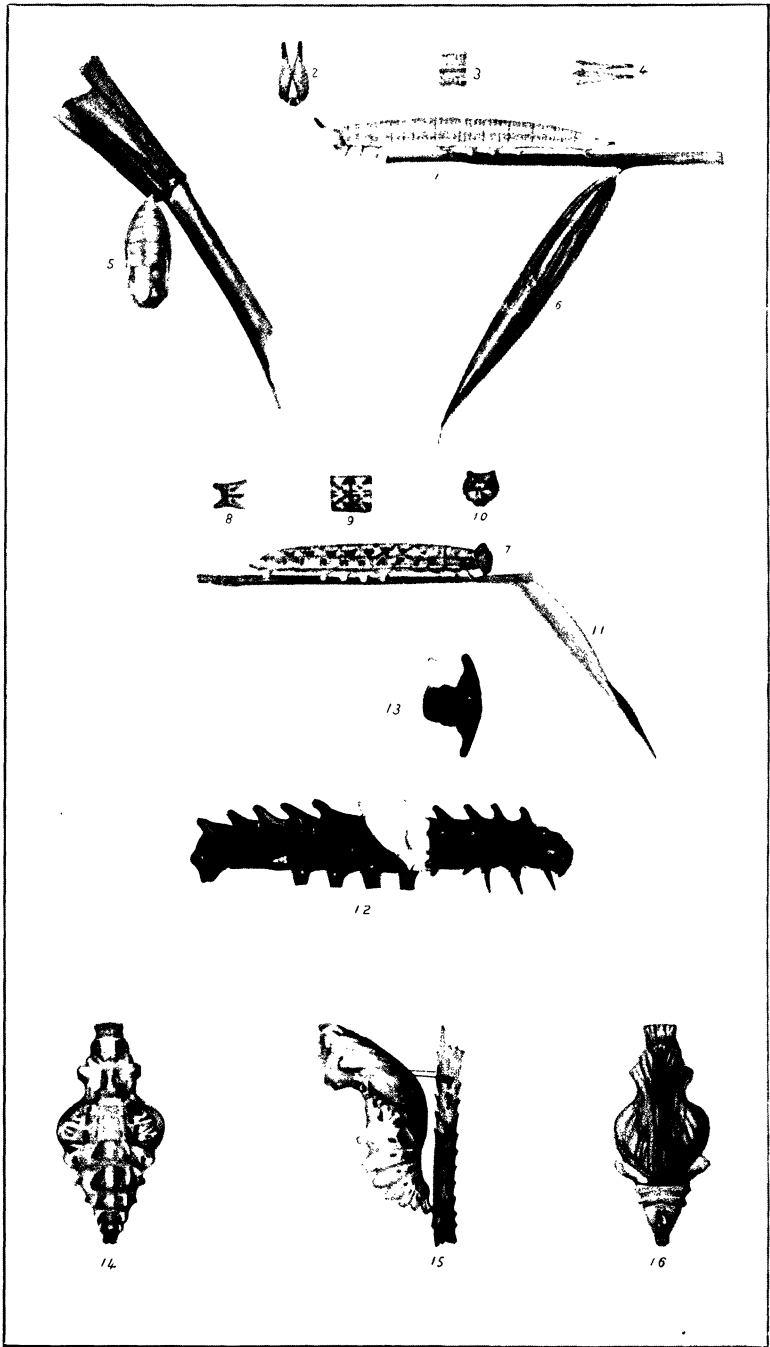


PLATE II. LETHE SICELIS, NEOPE GOSCHKEVITSCHII, AND PAPILIO ALCINOUS.





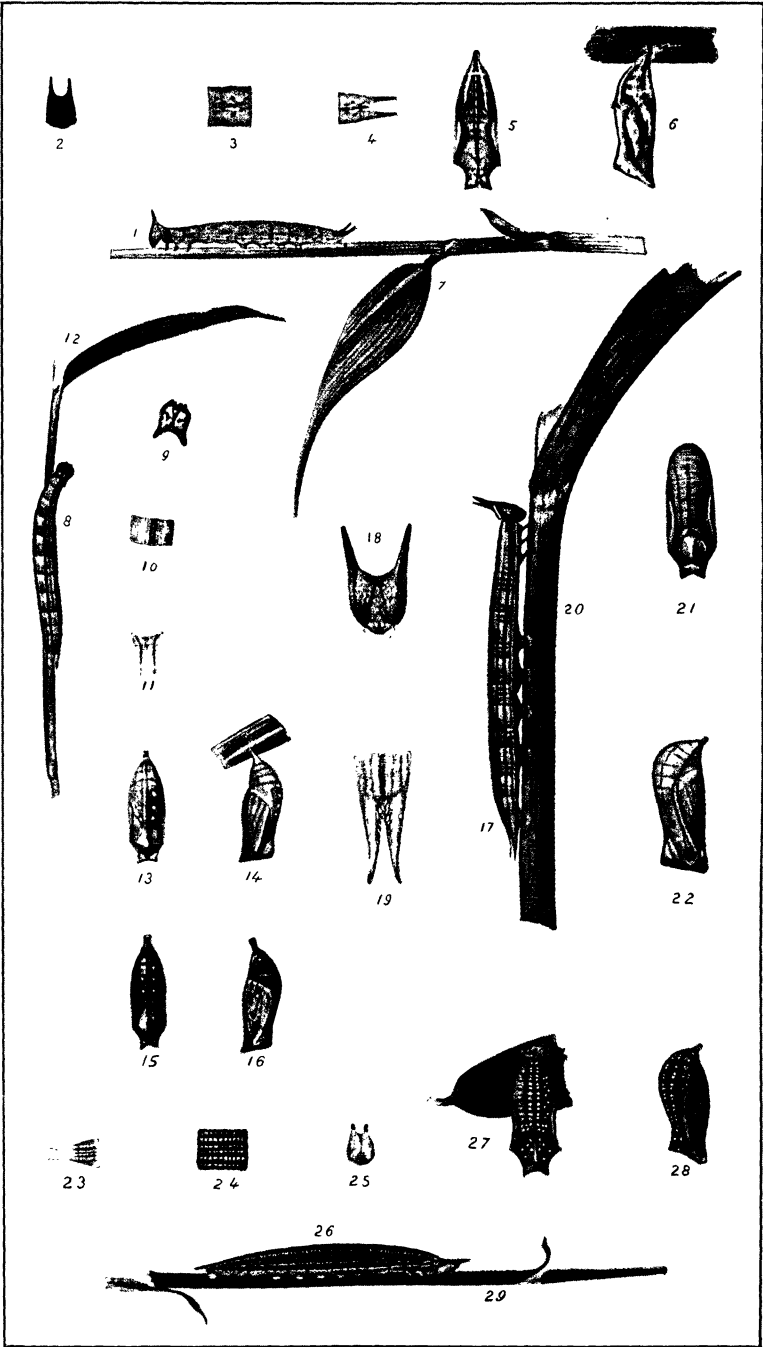


PLATE III. LETHE DIANA, L. MARGINALIS, L. CALLIPTERIS, AND SADARGA GOTAMA.



## NEUE FULGORIDEN VON DEN PHILIPPINEN: I. THEIL

Von L. MELICHAR

(Brünn, Moravia)

Eine Tafel

CIXIINÆ

### ***Benna sinuata* sp. nov. (Fig. 1.)**

Diese Art ist durch die etwas abweichende Form der Flügeldecken gekennzeichnet. Die Flügeldecken sind wie bei allen *Benna*-Arten nach hinten verbreitert. Der Apikalrand ist jedoch nicht schräg gerundet, sondern deutlich konkav, so dass die abgerundete Suturalecke stärker hervortritt da auch der innere Apikalrand schwach gebuchtet ist. Die Apikalecke ist breit abgerundet. Im übrigen treffen alle charakteristischen Merkmale dieser Gattung zu. Der Kopf, Thorax, die Unterseite und Beine blassgelb oder wachsgelb. Die Flügeldecken schmutzig milchweiss zur Spitze und zum Schlussrand leicht gelblich. Die Adern sind gelblichweiss, zart, nur in der Mitte der Flügeldecken und im Apikalteile braun, in den Endzellen am Apikalrande (mit Ausnahme der zweiten Apikalzelle) je ein brauner Längsstrich, zusammen 6 an der Zahl. Die stielartigen Fortsätze zu beiden Seiten des Körpers blassgelb, die erweiterte Spitze schwarz, mit aufliegendem weissen Sekret. Die Apikalrandader schwarz.

Länge ♂ 6.5 mm.

LUZON, Laguna, Mount Maquilung (1 Exemplar *Baker*).

DERBINÆ

### ***Syntames tubulifer* sp. nov. (Fig. 2.)**

Scheitel breiter als lang, von der Stirne nicht abgetrennt, die Ränder gekielt, in der Mitte ein Kiel, welcher sich auf die Stirne fortsetzt. Stirne länglich, nicht schmal, die Seiten schwach nach aussen gebogen und gekielt. Fühler kurz, jedoch von oben sichtbar, das zweite Fühlerglied doppelt so lang wie breit, etwas keulenförmig. Subantennalplatte fehlt. Clypeus länglich dreieckig, in der Mitte schwach gekielt. Pronotum länger als der Scheitel, vorne schwach gerundet, hinten flach gebuchtet, mit 3 scharfen Kielen, die Seitenkiele stark nach aussen konkav, die Hinterecken des Pronotums erreichend. Schildchen breit, stark gewölbt, mit 3 parallelen Längskielen, die Seitenkiele dem

Mittelkiel genähert. Flügeldecken mehr als doppelt so lang wie einzeln breit, der äussere Sektor nahe der Basis gegabelt (Subcosta und Radia nach Kirkaldy), der zweite Sektor in der Mitte der Flügeldecken, der innere ungefähr hinter der Mitte der Clavusnaht gegabelt. Im Clavus eine gegabelte Ader, der Costalrand ist hinter der Mitte eine kurze Strecke fein quer-gestrichelt. Hinterschienen mit einem sehr kleinen Dorne hinter der Mitte. Ein ganz besonderes Merkmal für diese Art sind auf jeder Seite des Bauches befindliche zwei Röhren welche wahrscheinlich Trachealröhren sind. Die erste längere Röhre befindet sich an der Grenze zwischen der Hinterbrust und des basalen Ventralsegmentes, und hat zwei Öffnungen, eine grössere vorne, eine kleinere hinten, die zweite kürzere Röhre befindet sich in der hinteren Seitenecke des 1. Ventralsegmentes und hat nur eine Öffnung; die Basis der Röhrrchen ist schwarz, die Spitze gelb.

Der ganze Körper ist schwarz, glänzend, bloss die Bauchlappen des Pronotums, das 2. Fühlerglied, mit Ausnahme der schwarzen Basis, die Mittel- und Hinterbrust und die Beine schmutzig blassgelb. Im Apikalteile der Flügeldecken 13 Randmakeln (Spitzen der Endadern) am Aussenrande und eine Makel am Innenrande schmutzig weiss. Die Schenkel etwas bräunlich, das Basalglied der Hintertarsen halb so lang wie die Hinterschiene, in der Mitte bräunlich.

Länge ♂ ♀ 4 mm.

LUZON, Laguna, Mount Maquiling (2 Exemplare *Baker*).

*Vekunta lineata* sp. nov.

Blassgelblich, die Augen, eine Mackel in der Mitte des Clypeus, eine Längsbinde nahe dem Costalrande, der Schlussrand, eine Mackel auf den Seiten der Vorderbrust und die Ränder der Deckschuppen schwarz. Der Scheitel ist so breit wie an der Basis, nach vorne etwas verschmälert, die gehobenen Seitenränder mit Körnchen dicht besetzt. Der Scheitel bildet mit der Stirne eine Ecke, die Stirne lang, schmal, zum Clypeus etwas verbreitert, in der Mitte nicht gekielt. Fühler kurz, das 2. Fühlerglied ziemlich gross, globulös. Subantennalplatte fehlt. Die Kiele des Pro- und Mesonotums sehr undeutlich. Flügeldecken länglich schmal, die Adern gelblichweiss, am Costalrande feine Körnchen und zu beiden Seiten des äusseren Clavusader eine Reihe solcher jedoch stärkerer Körnchen. Der Apikalteil leicht rauchbraun. Unterseite und Beine blassgelblich.

Länge ♂ 5 mm., ♀ 6 mm.

LUZON, Laguna, Mount Maquiling (2 Exemplare *Baker*).

**Megatropis interruptolineata** sp. nov.

Strohgelb, glänzend, Flügeldecken mit 3 schwarzen Längsstrichen und zwar: ein Strich an der Basis des Clavus in der Nahtzelle, der zweite tiefer hinten in der Mitte der Suturalzelle des Coriums und der dritte in der Mitte des Coriums zwischen dem mittleren und inneren Sektor. Im Apikalteile 4 querliegende Zellen. Die Stirne von der Seite betrachtet gerundet, mit dem gerundeten and gehobenen Scheitelrande eine leichte Einkerbung bildend, so dass die Abrundung keine vollständige ist. Die Augen halbmondförmig, die Fühler tief unten eingelenkt, das 2. Fühlerglied reicht bis zum vorderen Augenrande, ist cylindrisch, an der Spitze eingekerbt, die Fühlerborste distal eingefügt. Der obere Scheitelrand ist mit feinen Körnchen (sensible Organe) besetzt.

Länge 8 mm.

LUZON, Laguna, Los Baños (*Baker*).

**Megatropis obliquefasciata** sp. nov. (Fig. 3.)

Weiss, Stirne von der Seite betrachtet parabolisch vorgezogen, der Scheitelrand hinten gerundet, nach vorne fast horizontal in die Wölbung der Stirne übergehend, die Breite der Stirne vor den Augen beträgt gut den dreifachen Längsdurchmesser des Auges. Vor dem Auge eine rötliche Querbinde. Augen schwarz. Fühler lang, cylindrisch, bis über die Mitte der Wangen reichend, cylindrisch zur Spitze verschmälert, an der Spitze rötlich, eingekerbt, Fühlerborste distal. Die Basis des zweiten Fühlergliedes ist in einen gleich dicken Fortsatz nach hinten verlängert, welcher ungefähr  $\frac{1}{4}$  der Länge des 2. Fühlergliedes beträgt. Fühlerdecken hyalin, milchweiss, mit weissen Adern und einer braunen schrägen Querbinde, welche von der Clavusspitze schräg nach hinten und aussen zum Costalrande zieht. Im Apikalteile 4 querliegende Zellen. Die Apikalzellen am Innenrande bräunlich gesäumt. Flügel hyalin, mit weissen Adern. Körper und Beine blass gelblichweiss.

Länge sammt Flügeldecke 8–9 mm.

LUZON, Laguna, Mount Maquiling (*Baker*).

**Leptaleocera bakeri** sp. nov.

Lang gestreckt, scharlachrot, die Augen, die Deckschuppen, eine von der Basis bis zum Apikalrande reichende Längsbinde in der Mitte der Flügeldecken und der schmale innere Rand des Apikalteiles hinter der Clavusspitze schwarz. Der Scheitel und die Stirne bilden von der Seite betrachtet einen zusammenhängenden Bogen. Die Wangen kaum so breit wie der Querdurch-

messer des Auges. Das Auge hat die für die Gattung charakteristische Form, in dem das vordere Ende des Auges sich verschmälert und mit dem Stirnrande parallel und bogenförmig bis zur unteren Wangenecke herabreicht. Die Fühler sind bei diesem Exemplare leider abgebrochen. Unterseite und Beine scharlachrot, die Schienen mehr gelblich. Diese schöne Cicade ist nach der Färbung und Zeichnung, der eigentümlichen Form der Augen leicht zu erkennen.

Läng ♂ samt Flügeldecke 5 mm.

LUZON, Laguna, Mount Maquilang (1 Exemplar *Baker*).

#### Genus **DENDROKARA** novum

Eine durch die Form der Fühleranhängsel an die Gattung *Devandanda* Dist. erinnernde Gattung. Der Körper ist länglich, schmal. Der Scheitel mit der Stirne von der Seite betrachtet gerundet. Scheitel dreieckig, ziemlich breit, in der Mitte nicht gekielt. Augen klein, länglich oval. Clypeus kürzer als die Stirne, gewölbt, in der Mitte nicht gekielt. Die Fühler sind in der unteren Wangenecke eingelenkt, das Basalglied länglich, flach, an die Wangen angelegt, das 2. Fühlerglied kurz, oval oder länglich oval, mit dem ersten Gliede einen rechten Winkel bildend, nach aussen gerichtet, an der Basis mit kurzen oder langen, oft moosartig verzweigten Appendices. Pronotum schmal, in der Mitte deutlich gekielt. Schildchen stark gewölbt, mit 3 Kielen, die Seitenkiele nach aussen konkav, dem Mittelkiel genähert. Flügeldecken lang, schmal, hinten schräg abgerundet, der innere Apikalrand hinter der Clavusspitze etwas vorgewölbt. Das Geäder ist aus der Abbildung ersichtlich. Flügel etwas kürzer als die Flügeldecke, aber immer mehr als Zweidrittel der ganzen Länge. Beine grazil, Hinterschienen ohne Dornen.

Typ. gen.: *Dendrokara monstrosa* sp. nov.

*Dendrokara monstrosa* sp. nov. (Fig. 4.)

Die Stirne bildet mit dem Scheitel (von der Seite betrachtet) keinen einfachen Bogen, sondern der Scheitel ist höher gewölbt und bildet mit dem Stirnbogen eine seichte Einkerbung. Der Scheitel und die Wangen mit Ausnahme einer kleinen zentralen Partie schwarz. Pronotum auf der Scheibe pechbraun, an den Seiten gelb. An der Basis des 2. Fühlergliedes sind 3–4 lange, moosartig geformte schwarze Anhängsel verschiedener Länge. Das 2. Glied selbst ist länglich oval, schwarz, mit feinen weissen Wärzchen besetzt, die Spitze mit einem roten Punkt, die kurze Fühlerborste etwas distal gestellt. Schildchen schwarz, die Spitze breit gelb. Flügeldecken pechbraun, in der Mitte breit

gelb, und eine grosse gelbe Mackel am inneren Apikalrande hinter der Clavusspitze. Brust und Beine gelb, Hinterleib pechbraun. Diese Art ist sofort nach den eigentümlichen Anhängseln der Fühler zu erkennen. Die Stirnbildung erinnert an die Gattung *Megalropis*, aber die Augen sind nicht halbmondförmig, sondern rund, die Fühler ganz abweichend.

Länge ♂ 7 mm.

LUZON, Laguna, Los Baños (1 Exemplar *Baker*).

*Dendrokara torva* sp. nov. (Fig. 5.)

Von derselben Form und Grösse, aber der Scheitel (von der Seite betrachtet) bildet mit der Stirne einen gleichmässigen Bogen. Das 2. Fühlerglied ist globulös mit eingeschnürter Basis, aus welcher zwei kurze schwammartig geformte Blätter entspringen, welche das Fühlerglied schalenförmig fast einschliessen. Der Wangenrand und die ganze Oberseite des Körpers braun, glänzend, die Unterseite samt Beine gelb, der Hinterleibsrücken pechbraun. Die Form und das Geäder der Flügeldecken genau wie bei *monstrosa*. Diese Art ist durch die Fühlerbildung genügend gekennzeichnet.

Länge ♂ 7 mm.

LUZON, Laguna, Los Baños (1 Exemplar *Baker*).

#### DELPHACINÆ

*Tropidocephala philippina* sp. nov.

Weib. Scheitel so lang wie das Pronotum, nach vorne verschmälert und leicht nach unten gebogen, sowie Pronotum und Schildchen grünlichgelb oder schmutzig gelb, ohne Zeichnung. Stirne blass grünlichgelb, am unteren Ende des Mittelkieses ein brauner Fleck. Clypeus schwarzbraun, Fühler gelb, am 2. Fühlergliede ein schräger schwarzer Strich, die Wangen unterhalb der Fühler schwarz, Flügeldecken hyalin, mit blassgelblichen fein granulierten Adern, am Ende des mittleren Sektors ein schwarzer glänzender Höcker, der Clavus grünlichgelb, im Apikalteile zum inneren Rande eine gelblichbraune Mackel, an den Spitzen der Endnerven schwarze Punkte (2–3), und ein kleiner Punkt hinter der Mitte des Schlussrandes. Unterseite und Beine grünlichgelb.

Männchen. Die kleineren Männchen ebenso gezeichnet, die dunkle Färbung breitet sich mehr aus und verdrängt die grünlichgelbe Färbung bis auf einen kleinen Saum am Schlussrande, im Apikalteile einige helle Randflecken. In der Mitte der Flügeldecken nur ein dunkler glänzender Höcker wie beim ♀.

Länge ♂ 2.5 mm., ♀ 3 mm.

LUZON, Laguna, Los Baños (*Baker*).



Genus **BAMBUSARIA** novum

Kopf samt Augen etwas schmaler als der Thorax. Scheitel nur wenig die Augen überragend, vorne gerundet, die Seiten nach vorne schwach konvergierend, gekielt, in der Mitte ein deutlicher starker Längskiel, welcher sich auf die Stirne fortsetzt. Stirne länglich, viereckig, die Seiten parallel, oben und unten (Clypeusnaht) gerade, die Seiten stark gekielt, der ebenso starke Mittelkiel auf den Clypeus verlängert, dessen Seiten sowie die Wangen ebenfalls gekielt sind. Augen halbkugelig, dicht am unteren Rande die Fühler eingelenkt; dieselben sind lang, das Basalglied etwas wenig länger als das 2. Fühlerglied, zusammengedrückt kanntig, das 2. Fühlerglied an der Basis oben mit einer glatten Platte versehen, der übrige Teil mit kleinen Wärzchen und Härchen bedeckt. Pronotum breit, hinten flach gebuchtet, mit 3 Kielen, die Seitenkiele nach vorne konvergierend. Schildchen breit, gewölbt, mit 3 Längskielen, die Seitenkiele dem Mittelkiel etwas genähert, daher nicht in der Fortsetzung der Pronotumkiele liegend, nach hinten schwach divergierend.

Männchen. Das Pygophor ist länglich oval, der Aussenrand etwas gewulstet, in der Mitte des unteren Randes etwas erhaben. Die Griffel gross, hornartig, aus breiter Basis zur Spitze verschmälert, nach aussen gebogen, mit der Spitze einander berührend.

Länge ♂ 4 mm., ♀ 5 mm.

LUZON, Laguna, Mount Maquiling (*Baker*).

Kommt auf Bambusrohr vor und ist demselben schädlich.

Typ. Gen.: *Bambusaria picta* sp. nov.

**Bambusaria picta** sp. nov. (Fig. 6.)

Bräunlichgelb. Die Stirne, Clypeus und Wangen schwarz, die Kiele weiss; Scheitel schwarz, die Kiele weiss, die schwarze Färbung des Scheitels verlängert sich auf das Pro- und Mesonotum, nach hinten zu beiden Seiten des hellen Mittelkieses eine Längsbinde bildend. Das Basalglied der Fühler ist schwarz liniert, die Kanten weiss. Die Platte auf der Oberseite des 2. Fühlergliedes weiss mit einem schwarzen Punkt. Flügeldecken hyalin, mit einer breiten braunen Querbinde in der Mitte und einer halbmondförmigen, 2–3 hyaline Randflecken einschliessende Marginalbinde, am inneren Apikalrande, an den Enden der beiden äusseren Endadern spitzdreieckige Mackeln, eine kleine Mackel an der Teilungsstelle des inneren Sektors und eine solche am Schlussrande vor der Clavusspitze. Die Sektoren

sind hinter der Querbinde verdickt, pechbraun, daselbst mit feinen Körnchen besetzt. Flügel hyalin, mit pechbraunen Adern, die Vorderbrust braun, an den Seiten der Mittelbrust eine braune runde Makel, die Bauchsegmente an der Basis braun, die Ränder hellgelb. Sämtliche Schenkel schwarz längsliniert. Flügeldecken hyalin, hinten abgerundet, der äussere und innere Sektor hinter der Mitte gegabelt, die Gabeläste durch eine Queraderlinie untereinander verbunden, aus welcher 5 Endadern entspringen, die beiden äusseren nach aussen gebogen, die 3. gerade die 4. und 5. nach innen stark gekrümmt. Im Clavus eine Gabelader. Beine einfach; Hinterschienen mit 2 kleinen Dornen, der erste dicht an der Basis, der zweite hinter der Mitte. Der bewegliche Apikalsporn stark.

Genus **MALAXA** novum

Kopf samt Augen schmaler als der Thorax. Scheitel länglich, nach vorne etwas wenig verschmälert, die Augen nur wenig überragend, mit fast undeutlichen Kielen. Stirne sehr lang und schmal, parallelseitig, an den Rändern und in der Mitte, sowie die Wangen gekielt. Der Mittelkiel auf der Scheitelspitze ein sehr kleines seichtes Dreieck bildend. Augen halbkugelig. Fühler sehr lang, die Basis der Flügeldecken überragend, cylindrisch, dünn, das 2. Fühlerglied um  $\frac{1}{4}$  länger als der Basalglied, die Borste sehr kurz. Pronotum breit, vorne gerade abgestutzt, mit 3 Kielen und 2 Grübchen zwischen denselben. Schildchen breiter als lang, mit 3 Längskielen. Flügeldecken hyalin, hinten stark zugespitzt, mit 3 Sektoren, welche aus einer länglichen Basalzelle entspringen. Die beiden äusseren Sektoren einfach, der innere Sektor gegabelt, 5 Endadern, die mittlere gegabelt, der äussere Gabelast in die Apikalspitze mündend. Im kurzen Clavus eine Gabelader. Beine sehr grazil, Hinterschienen mit einem sehr kleinen Dorn in der Mitte. Endsporn fast so lang wie das Basalglied der Hintertarsen, dünn, aalförmig.

Typ. gen.: *Malaxa acutipennis* sp. nov.

**Malaxa acutipennis** sp. nov. (Fig. 7.)

Kopf, Thorax und Unterseite samt Beine wachsgelblich. Flügeldecken hyalin mit zwei braunen Querbinden. Die erste Binde schmal, vor der Mitte, die zweite breitere auf der Queraderlinie, sämtliche Endadern braun gesäumt. Auf dem Hinterleibsrücken zwei breite Längsbinden. Die Schenkel vor der Spitze schwarz geringelt, die Spitzen der Schienen schwärzlich.

Länge ♀ ungefähr 3.5 mm.

LUZON, Laguna, Los Baños (1 Exemplar *Baker*).

## ISSINÆ

Genus **AUGILINA** novum

Körper lang gestreckt. Kopf samt Augen schmaler als der Thorax, in einen dreieckigen nach oben gekrümmten kurzen Fortsatz verlängert. Die Seiten des Scheitels geschärft, nach vorne konvergierend, die Spitze dicht vor den Augen nach oben gebogen, die Scheitelfläche glatt, nicht gekielt oder mit einem schwachen Mittelkiel versehen. Stirne länglich, nach unten verbreitert, die Ränder geschärft gehoben, die Stirnfläche an der Basis vertieft, unten mehr oder weniger gewölbt, nicht gekielt. Clypeus länglich dreieckig, gewölbt, nicht gekielt. Rostrum bis zur Mittelbrust reichend, kurz, Augen gross, halbkugelig, stark vorgewölbt, die Fühler kurz, Fühlerborste lang. Ocellen vorhanden. Pronotum glockenförmig, an den Seiten gerundet, oben konvex, vorne schwach gerundet, hinten gerade auf der Scheibe 2 nach hinten divergierende und abgekürzte vorne zusammenstossende kurze Kiele, welche eine dreieckige Grube begrenzen. Schildchen stark gewölbt, breiter als lang, mit 3 parallelen schwachen Längsbinden. Flügeldecken sehr lang und schmal, die Hinterleibsspitze überragend, hinten abgerundet, am Aussenrande in der Mitte leicht gebuchtet. Drei lange Adern, von welchen die beiden äusseren sich nahe der Basis miteinander verbinden; die Sektoren bilden im hinteren Viertel der Flügeldecken durch Gabelung zwei pentagonale Zellen und eine innere viereckige Zelle, welche auf einer von der Clavusspitze nach aussen ziehenden geraden Querader aufsitzen. Aus der letzteren entspringen 5 Endadern, die 2. und 3. bilden eine Gabel und entspringen mit der 4. Ader aus einem Punkte. Der Apikalrand besitzt einen schmalen fein quergestrichelten Saum. Der Clavus sehr lang, die beiden Clavusadern nahe der Basis vereinigt, eine sehr kurze Gabel bildend, der Gabelschaft mündet vor der Clavusspitze in die Clavusnaht. Flügel wenig kürzer als die Flügeldecken, mit wenigen Längsadern, Hinterleib walzenförmig, lang gestreckt, nach hinten verengt. Beine sehr lang, grazil, insbesondere die Vorderschenkel und Schienen auffallend lang und dünn, Hinterschienen mit 1 Dorne hinter der Mitte. Basalglied der Hintertarsen lang.

Typ. gen.: *Augilina longipes* sp. nov.

*Augilina longipes* sp. nov. (Fig. 8.)

Kopf in einen kurzen dreieckigen, dicht vor den Augen nach oben gekrümmten Fortsatz verlängert. Der Scheitel und die

Stirne samt Clypeus schwarz, glänzend, die Seitenkiele des Scheitels und der Stirne weiss. Pronotum weiss, die zwischen den Kielen liegende kleine dreieckige Grube schwarz. Die Seiten des Kopfes mit Ausnahme der Schläfen schwarz, glänzend, Fühler gelblich. Schildchen schwarz, glänzend, die Spitze blassgelblich, mit einem schwarzen Längsstrich. Flügeldecken hyalin, schwach milchig getrübt, an der Basis rötlich, mit einer breiten dunkelbraunen Querbinde auf der Querader und Teilungsstellen der Sektoren. Sämtliche Adern sind tief schwarz. Die Vorderbrust und die Vorderhüften schwarz, glänzend, die Mittel- und Hinterbrust blassgelb, auf der Seite eine grosse schwarze Mackel. Hinterleib blassgelb, eine breite Querbinde und die Spitze schwarz. Vorder- und Mittelschenkel bräunlichgelb, an der Unterseite schwarz, die Schienen und Tarsen pechbraun, die Hinterbeine tief schwarz, die Hintertarsen weiss.

Länge ♂ 7.5 mm.; Breite 2 mm.

LUZON, Laguna, Los Baños (1 Exemplar *Baker*).

#### Genus **SYMPLANA** Kirby

*Symplana* KIRBY, Journ. Linn. Soc. Zool. (1891), 24, 136. MELICHAR, Hom.-Fauna Ceylon (1903), 19. DISTANT, Fauna Brit. Ind., Rhynch. (1906), 3, 254.

Kopf in einen dreieckigen nach oben gebogenen Fortsatz verlängert. Der Fortsatz ist von der Seite betrachtet spitzig, von oben betrachtet abgestumpft, fast quer gestutzt. Der Scheitel nach vorne verschmälert, die Seitenränder gehoben gekielt, so dass der Scheitel vertieft erscheint. Stirne lang schmal, mit 3 starken Kielen, welche sich auf der Stirnbasis miteinander verbinden. Clypeus länglich dreieckig, in der Mitte fein gekielt. Die Augen halbkugelig, Ocellen vorhanden, Fühler kurz, Fühlerborste lang, Rostrum kurz. Pronotum schmal, vorne schwach gerundet, hinten sehr schwach gebuchtet, fast gerade, ohne deutliche Kiele, hinter den Augen jederseits ein kleiner Höcker. Schildchen breiter als lang, mit zwei parallelen schwachen Seitenkielen, der Mittelkiel sehr undeutlich. Flügeldecken lang, schmal, hinten abgerundet, mit 3 einfachen Sektoren, die beiden äusseren an der Basis miteinander verbunden, die Sektoren bilden durch Gabelung hinter der Mitte eine viereckige und zwei pentagonale Zellen, welche auf einer geraden Querader aufsitzen, aus welcher 5 Endadern entspringen, die 2. und 3. bilden eine Gabel, der Gabelschaft mit der 4. Ader aus einem Punkte entspringend. Clavus sehr lang, die beiden Clavusadern nahe der Basis vereinigt, die Gabeläste länger als bei

*Augilina*, Flügel wenig kürzer als die Flügeldecken. Beine einfach, nicht auffallend lang, Hinterschienen mit einem Dorne hinter der Mitte.

Typ. gen.: *Symplana viridinervis* Kirby.

Kirby hat diese Gattung auf Grund eines auf Ceylon gefundenen Exemplares gegründet und stellte diese Gattung zu den Dictyophorinen, mit welchen sie eine grosse äussere Ähnlichkeit hat. Da ich diese Cikada nicht kannte, folgte ich in meiner Arbeit Hom. Fauna Ceylon der Angabe Kirby's. Distant sprach mit voller Berechtigung den Zweifel aus, dass diese Gattung eine Dictyophorinengattung sei. Das mir von Baker von den Philippinen eingesendete Exemplar ist ohne Zweifel die Kirby'sche *Symplana*, welche mit der philippinischen Gattung *Augilina* sehr verwandt ist. Die Form und die Bildung der Flügeldecken und das Geäder ist bei beiden vollkommen gleich, nur sind bei *Symplana* 3 Stirnkiele vorhanden, bei *Augilina* keine Kiele, die Beine sind bei *Augilina* auffallend lang, bei *Symplana* gewöhnlich lang. Zu den Dictyophorinen können beide Gattungen nicht gerechnet werden, weil dieselben keine Seitenrandkiele besitzen, der Hinterrand des Pronotums gerade ist und der Schaft der Clavusadern nicht in den Schlussrand mündet. Nach meiner Ansicht gehören beide Gattungen zu den Issinen und zwar in die Nähe der Gattung *Augila* Stål mit welcher sie eine gewisse Verwandschaft zeigen.

*Symplana viridinervis* Kirby. (Fig. 9.)

*Symplana viridinervis* KIRBY, Journ. Linn. Soc. Zool. (1891), 24, 136, Tafel VI, fig. 11; MELICHAR, Hom.-Fauna Ceylon (1903), 19; DISTANT, Fauna Brit. Ind., Rhynch. (1906), 3, 254.

Der ganze Körper blassgrün, mit einer orangegelben Längsbinde, welche von der Scheitelspitze über das Pro- und Mesonotum und den Schlussrand bis zur Clavusspitze zieht. Die Spitze der Dornen der Hinterschienen dunkel.

Länge 7–8 mm.

LUZON, Laguna, Mount Maquiling (*Baker*); Ceylon, Pundaloya (*Kirby*).

*Eupilis rubrovenosa* sp. nov.

Der *E. nigrinervis* Stål ähnlich, die Adern der Deckflügel sind lebhaft rotbraun. Scheitel quadratisch, mit zwei eingepressten schwarzen kommaförmigen Längsstrichen. Stirne länglich, nach oben schwach verengt, mit 3 schwachen Kielen, die äusseren nach aussen gebogen, auf der Basis mit dem Mittelkiel verbunden. Die Stirnbasis ist mit hellen flachen Körnchen besetzt,

welche sich jederseits längs des Stirnseitenrandes bis ungefähr zur Mitte der Stirne herabziehen. Die Stirne braun, mit 4 helleren Flecken. Flügeldecken und das Geäder wie bei *E. nigri-nervis*, die Flügeldecken fast hyalin, nicht gefärbt, höchstens zum Schlussrande hellbräunlich, die rotbraunen Adern stark vortretend. Flügel hyalin, mit pechbraunen Adern, die Unterseite und Beine bräunlichgelb, die Schenkel und Schienen an den Kanten dunkel.

Länge 11 mm.

LUZON, Laguna, Mount Maquiling (*Baker*).

*Eupilis hyalinocosta* sp. nov.

Von allen bekannten Arten sofort dadurch zu unterscheiden, dass die innere Hälfte der Flügeldecken rotbraun oder gelblich-braun, von helleren Adern durchsetzt ist, die äussere Hälfte samt Adern hyalin und graulichweiss ist. Ferner befindet sich stets auf den grünen Brustlappen des dunklen Pronotums ein grosser schwarzer Punkt. Auf der Basis der Stirne in den Stirndreiecken keine Körnchen, diese sind bloss am Seitenrande der Stirne bis zur Spitze sichtbar. Die Stirne ist nicht dunkel gezeichnet, die Unterseite und Beine schmutzig olivengrün oder graulichgelb. Auf dem quer viereckigem Scheitel nahe dem Hinterrande 2 schwarze eingestochene Punkte, sowie 2 Grübchen auf der Scheibe wie bei allen Arten.

Länge 10–12 mm.

LUZON, Los Baños, Mount Maquiling (*Baker*).

*Hemisphaerius affinis* sp. nov.

Körper oval, olivengrün. Die Stirne lederartig gerunzelt, grün. Der Clypeusspitze schwarz. Unterseite und Beine schmutzig graulichgelb, die Vorder- und Mittelschienen an der Spitze schwarz, die Hinterschenkel bräunlich. Dem *H. chlorophanus* Mel. durch die lederartig gerunzelte Stirne sehr nahe stehend, unterscheidet sich von dieser Art durch schwarze Clypeusspitze und die bloss an den Spitzen schwarzgeringelten Schienen der vorderen Beine.

Länge 5 mm.; Breite 3.5 mm.

LUZON, Laguna, Mount Maquiling (*Baker*).

*Hemisphaerius triangularis* sp. nov.

Von der Form und Grösse der *H. affinis*. Stirne hellgrün, schmal rot gerandet, mit einem roten Dreieck in der Mitte. Clypeus schwarz, Scheitel rot. Pro- und Mesonotum hellgrün, die Ränder des letzteren und ein kleines Basaldreieck rot. Flügeldecken fein lederartig gerunzelt, olivengrün, der Schluss-

rand von der Basis bis zur Mitte rot gerandet, daneben ein hellgrüner Längsstreifen, welcher nach aussen durch einen roten Streifen begrenzt ist. Die Costalrandader schwärzlich. Unterseite und Beine schmutzig graulichgelb, die Schenkel mit Ausnahme der Basis und der Spitze, 2 Ringe an den Vorder- und Mittelschienen schwarz. Hinterschenkel bräunlich.

Länge 5 mm.; Breite 3.5 mm.

LUZON, Laguna, Mount Maquilung (*Baker*).

**Hemisphaerius rufus** sp. nov.

Stirn lederartig gerunzelt wie bei *H. affinis*, wie die ganze Oberseite blutrot, Clypeus mit Ausnahme der Basis schwarz. Die Beine schmutzig gelb, bloss die Spitzen der Vorder- und Mittelschienen schwarz, die Hüften und die Hinterschenkel, letztere mit Ausnahme der Spitze schwarz. Bauch mit 2-3 dunklen Querstreifen in der Mitte. Von *affinis* durch die blutrote Färbung der Oberseite verschieden.

Länge 5 mm.: Breite 4 mm.

LUZON, Laguna, Mount Maquilung (*Baker*).

Genus **LAPITHASA** novum

Kopf stark nach vorne vorgezogen. Der Scheitel parallelseitig, der über die Augen vorragende Teil doppelt so lang wie der Basalteil bis zum vorderen Augenrande, die Schläfenecken winkelig vorspringend, von der Seite betrachtet abgerundet. Scheitelränder etwas geschärft gekielt, in der Mitte ein vollständiger Längskiel. Stirne sehr lang, vor dem Clypeus plötzlich verbreitert, indem die Seitenränder eine nach aussen abgerundete Ecke bilden, mit 3 Kielen auf der Stirnfläche, welche sich auf der Stirnbasis miteinander verbinden. Clypeus ein Drittel der Stirnlänge, an den Seiten nur in der Mitte gekielt. Rostrum, die Hinterhüften erreichend, das letzte Glied kurz. Fühler kurz, das 2. Fühlerglied nur wenig länger als breit. Ocellen vorhanden. Pronotum vorne schwach gerundet, hinten fast gerade, oben mit 3 Kielen, ein Seitenrandkiel. Schildchen mit 3 Längskielen, die seitlichen schwach nach vorne konvergierend. Flügeldecken doppelt so lang wie einzeln breit, die Seiten parallel, hinten breit abgerundet, die Apikalecke stärker abgerundet als die Suturalecke. Der 1. Sektor nahe der Basis, die beiden inneren Sektoren hinter der Mitte gegabelt. Die Costalmembrane an der Basis schmal, nach hinten verbreitert, quergeadert. Im Apikalteile zahlreiche dichte Apikaladern, welche durch zahlreiche Queradern untereinander verbunden sind. Ein dem Apikalrande genäherte Subapikallinie. Die

beiden Clavusadern hinter der Mitte des Schlussrandes vereinigt. Die Vorder- und Mittelbeine zusammengedrückt, die Schenkel an der Unterkante, die Schienen an der Aussenkante mässig erweitert. Hinterschienen zur Spitze verbreitert mit 2 starken Dornen vor der Spitze, das Basalglied der Hintertarsen länglich.

Typ. gen: *Lapithasa bakeri* sp. nov.

*Lapithasa bakeri* sp. nov. (Fig. 10.)

Braun. Flügeldecken pechbraun, auf der inneren Hälfte mehr oder weniger gelblich, nur gebändert und gesprenkelt, am Costalrande hinter der Mitte eine grosse gelblichweisse hie und da braune quergesprenkelte Mackel, vor derselben am Costalrande zahlreiche kleine hyaline Fleckchen, nach hinten mehrere hyaline Querstriche und dreieckige Randmackeln, insbesondere ist am Apikalrande aussen und innen je eine Quermackel, dazwischen in der Mitte des Apikalrandes eine kleine dreieckige Mackel. Vor der Suturalecke ist auf dunklem Grunde ein kleiner schwarzer Punkt. Flügel rauchbraun, mit schwarzen Adern. Die Unterseite und Beine braun. Das letzte Glied der Schnabelscheide weiss.

Länge 12 mm.

LUZON, Los Baños (*Baker*).

Über die systematische Stellung dieser Gattung bin ich nicht im Klaren. Nach dem äusseren Habitus würde man geneigt sein dieselbe zu den Lophopinen zu rechnen, aber dagegen spricht der Umstand, dass das Basalglied der Tarsen lang, nicht verdickt ist. Zu den Dictyophorinen kann diese Gattung aus dem Grunde nicht gerechnet werden, weil der Schaft der Clavusnerven in die Clavusspitze mündet und der Hinterrand des Pronotums gerade ist, nicht winkelig ausgeschnitten. Gegen die Einreihung in die Subf. Issinæ spricht der starke Seitenrandkiel auf dem Pronotum. Die Form der Stirne erinnert sehr an die von *Acarua* und *Kasserota* und würde vielleicht am ehestens in die Nähe der letztgenannten Gattung zu stellen sein, von welcher sich diese Gattung durch den langen Scheitel und die zusammengedrückten, etwas erweiterten Vorderbeine unterscheidet.



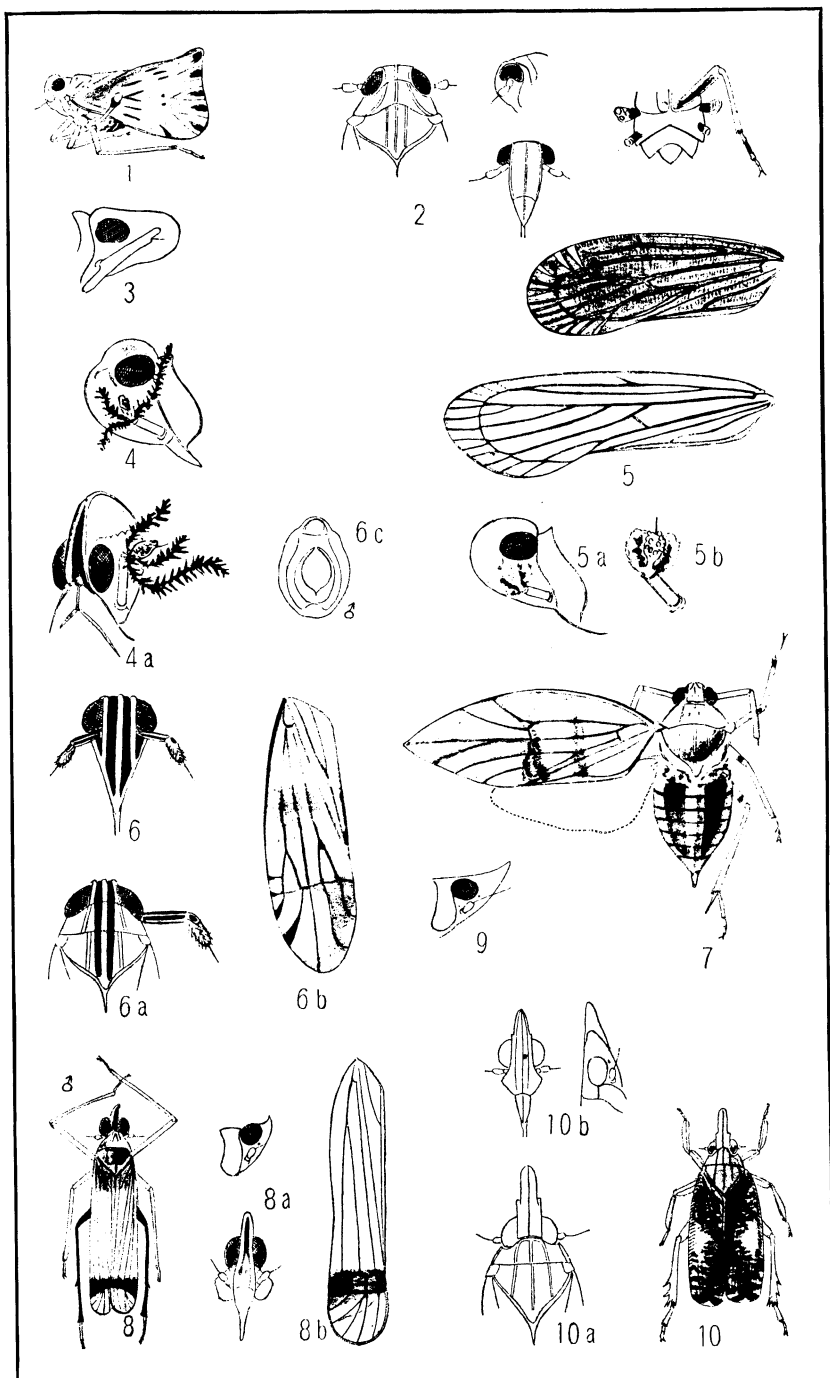


## TAFELERKLÄRUNG

### TAFEL I

- FIG. 1. *Benna sinuata* sp. nov.  
2. *Syntames tubulifer* Mel.  
3. *Megatropis obliquefasciata* sp. nov.  
4. *Dendrokara monstrosa* sp. nov.  
5. *Dendrokara torva* gen. et sp. nov.  
6. *Bambusaria picta* gen. et sp. nov.  
7. *Malaxa acutipennis* gen. et sp. nov.  
8. *Augilina longipes* gen. et sp. nov.  
9. *Symplana viridinervis* Kirby.  
10. *Lapithasa bakeri* gen. et sp. nov.





TAFEL I. NEUE FULGORIDEN VON DEN PHILIPPINEN.



# ENUMÉRATION DES SERPHIDES (PROCTOTRUPIDES) DES ÎLES PHILIPPINES AVEC DESCRIPTION DE GENRES NOUVEAUX ET D'ESPÈCES NOUVELLES<sup>1</sup>

Par J. J. KIEFFER  
(Bitsch, Germany)

Les premiers auteurs qui se sont occupés des *Serphides* ou *Proctotrupidés* sont: Westwood, Ashmead, Brown et Crawford. Le nombre des espèces observées par eux est de 27. J'ai ajouté à ce chiffre 70 autres espèces, qui ont été recueillies à Los Baños, Luzon, par le professeur Ch. Fuller Baker. Ces 97 espèces, auxquelles viennent s'ajouter 24 nouvelles espèces, se répartissent de la façon suivante:

## DRYINIDÆ

1. *Lestodryinus browni* Ashmead (*Dryinus*), Proc. U. S. Nat. Mus. (1905), 29, 109. ♀.
2. *Lestodryinus luzonicus* Kieffer, Boll. Zool. Portici (1913), 7, 189. ♀.
3. *Lestodryinus perkinsi* Kieffer, Bull. Soc. ent. France (1914), No. 1. ♀.
4. *Prodryinus* (?) *stantoni* Ashmead (*Dryinus*), Proc. U. S. Nat. Mus. (1904), 28, 134. ♀.

## BETHYLIDÆ

5. *Goniozus philippinensis* Ashmead, Proc. U. S. Nat. Mus. (1904), 28, 134. ♀.
6. *Goniozus depressus* Kieffer, Insecta (1913), 3, 318. ♀.
7. *Dissomphalus tibialis* Ashmead, Proc. U. S. Nat. Mus. (1904), 28, 134. ♀.
8. *Misepyrus exaratus* Kieffer, Insecta (1913), 3, 317. ♀.
9. *Misepyrus longiceps* Kieffer, Insecta (1913), 3, 318. ♀.
10. *Rhabdepyris luzonicus* Kieffer, Boll. Zool. Portici (1913), 7, 189. ♂.
11. *Epyris apertus* Kieffer, Boll. Zool. Portici (1913), 7, 189.
12. *Epyris philippinensis* Kieffer, Insecta (1913), 3, 258. ♂, ♀.
13. *Chlorepyris flavipennis* Kieffer, Boll. Zool. Portici (1913), 7, 189.
14. *Neurepyris tagala* Ashmead (*Epyris*), Proc. U. S. Nat. Mus. (1905), 29, 109. ♂.
15. *Xenepyrus compressicornis* Kieffer, Insecta (1913), 3, 259. ♂.
16. *Foenobethylus gracilis* Kieffer, Insecta (1913), 3, 257. ♂.
17. *Cleistepyrus minimus* Kieffer, Insecta (1913), 3, 257. ♂.
18. *Cleistepyrus minor* Kieffer, Insecta (1913), 3, 256. ♂.
19. *Cleistepyrus philippinensis* Kieffer, Insecta (1913), 3, 254. ♂, ♀.

<sup>1</sup> Since this paper was received, the author has sent descriptions of 1 more new genus and 4 more new species; namely, *Epyris filiformis*, genus *Uroscelio*, *Uroscelio luteipes*, *Dilapitha nitida*, and *Macroteleia flaviceps*. The descriptions of these species will be found under their respective genera, but the species are not included in the keys.—THE EDITORS.

## SCELIONIDÆ

20. *Prosparasion cæruleum* Kieffer, Boll. Zool. Portici (1913), 7, 190. ♂.
21. *Scelio philippinensis* Ashmead, Proc. U. S. Nat. Mus. (1905), 28, 963. ♀.
22. *Scelio aratigena* Kieffer, Insecta (1913), 3, 320. ♂, ♀.
23. *Scelio consobrinus* Kieffer, Insecta (1913), 3, 319. ♂, ♀.
24. *Scelio variicornis* Kieffer, Insecta (1913), 3, 319. ♂, ♀.
25. *Platyscelio abnormis* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 126. ♂.
26. *Platyscelio punctatus* Kieffer, Insecta (1913), 3, 321. ♂.
27. *Sparasion philippinense* Kieffer, Insecta (1913), 3, 320. ♂, ♀.
28. *Calliscelio philippinensis* Kieffer, Insecta (1913), 3, 322. ♂.
29. *Opisthacantha nigriclavata* Ashmead, Proc. U. S. Nat. Mus. (1905), 29, 399. ♀.
30. *Macroteleia manilensis* Ashmead, Proc. U. S. Nat. Mus. (1905), 28, 963, ♂; Crawford, Proc. U. S. Nat. Mus. (1910), 38, 127. ♀.
31. *Macroteleia crawfordi* Kieffer nom. nov. [*kiewferi* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 127. ♀; non *kiewferi* Brues.]
32. *Macroteleia striativentris* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 126. ♂, ♀.
33. *Macroteleia philippinensis* Kieffer, Insecta (1913), 3, 323, 367. ♂, ♀.
34. *Hoploteleia pacifica* Ashmead, Proc. U. S. Nat. Mus. (1905), 29, 112. ♀.
35. *Hoploteleia carinata* Kieffer, Insecta (1913), 3, 368. ♀.
36. *Hoploteleia philippinensis* Kieffer, Insecta (1913), 3, 369. ♂, ♀.
37. *Hoploteleia unidens* Kieffer, Insecta (1913), 3, 370. ♂, ♀.
38. *Camptoteleia carinata* Kieffer, Insecta (1913), 3, 387. ♀.
39. *Camptoteleia excavata* Kieffer, Insecta (1913), 3, 388. ♂.
40. *Chrestoteleia bakeri* Kieffer, Insecta (1913), 3, 389. ♂, ♀.
41. *Xenoteleia flavipennis* Kieffer, Insecta (1913), 3, 390. ♀.
42. *Hadronotus flavipes* Ashmead, Proc. U. S. Nat. Mus. (1905), 29, 399. ♀.
43. *Hadronotus philippinensis* Ashmead, Proc. U. S. Nat. Mus. (1904), 28, 153. ♀.
44. *Anteris atriceps* Kieffer, Insecta (1913), 3, 428. ♀.
45. *Habroteleia browni* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 125. ♂.
46. *Neurocacus philippinensis* Kieffer, Insecta (1913), 3, 429. ♂.
47. *Acolus luteipes* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 124. ♀.
48. *Hoplogryon longispina* Kieffer, Insecta (1913), 3, 429. ♂.
49. *Hoplogryon flaviiclava* Kieffer, Boll. Zool. Portici (1913), 7, 191. ♀.
50. *Hoplogryon roberti* Crawford (*Prosacantha*), Proc. U. S. Nat. Mus. (1910), 38, 125. ♂.
51. *Hoplogryon striaticeps* Crawford (*Prosacantha*), Proc. U. S. Nat. Mus. (1910), 38, 125. ♂.
52. *Telenomus catacanthæ* Ashmead, Canad. Ent. (1904), 36, 284. ♂, ♀.

## PLATYGASTERIDÆ

53. *Anopedias luzonicus* Ashmead, Proc. U. S. Nat. Mus. (1905), 28, 964. ♀.
54. *Ceratopsilus rufipes* Kieffer, Insecta (1913), 3, 461.

## CERAPHRONIDÆ

55. *Ceraphron manilæ* Ashmead, Proc. U. S. Nat. Mus. (1904), 28, 135. ♀.

## DIAPRIIDÆ

56. *Galesus manilæ* Ashmead, Proc. U. S. Nat. Mus. (1905), 29, 397. ♂, ♀.  
 57. *Galesus luzonicus* Ashmead, Proc. U. S. Nat. Mus. (1905), 29, 398. ♂.  
 58. *Galesus clavaticornis* Kieffer, Insecta (1913), 3, 430. ♀.  
 59. *Galesus philippinensis* Kieffer, Insecta (1913), 3, 431. ♂.  
 60. *Galesus crawfordi* Kieffer, Insecta (1913), 3, 432. ♂.  
 61. *Galesus curticeps* Kieffer, Insecta (1913), 3, 432. ♂.  
 62. *Hemigalesus niger* Kieffer, Insecta (1913), 3, 434. ♂, ♀.  
 63. *Hemigalesus rufus* Kieffer, Insecta (1913), 3, 434. ♂, ♀.  
 64. *Hemigalesus brevicornis* Kieffer, Insecta (1913), 3, 434. ♂.  
 65. *Hemigalesus gracilis* Kieffer, Insecta (1913), 3, 435. ♂.  
 66. *Lipoglyptus primus* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 122. ♂, ♀.  
 67. *Cologlyptus kiefferi* Crawford, Proc. U. S. Nat. Mus. (1910), 38, 124. ♀.  
 68. *Scapopria atriceps* Kieffer, Insecta (1913), 3, 441. ♀.  
 69. *Acidopria variicornis* Kieffer, Insecta (1913), 3, 442. ♂, ♀.  
 70. *Acidopria tricornuta* Crawford (*Loxotropa*), Proc. U. S. Nat. Mus. (1910), 38, 122. ♂, ♀.  
 71. *Acidopria monachanta* Kieffer, Boll. Zool. Portici (1913), 7, 192. ♂.  
 72. *Acidopria tetratoma* Kieffer, Insecta (1913), 3, 442. ♀.  
 73. *Phænopria rufa* Kieffer, Insecta (1913), 3, 455. ♀.  
 74. *Phænopria nigriceps* Kieffer, Insecta (1913), 3, 455. ♂.  
 75. *Phænopria exilis* Kieffer, Insecta (1913), 3, 456. ♂.  
 76. *Loxotropa philippinensis* Kieffer, Insecta (1913), 3, 456. ♂.  
 77. *Trichopria caudata* Kieffer, Insecta (1913), 3, 456. ♀.  
 78. *Trichopria analis* Kieffer, Insecta (1913), 3, 457. ♀.  
 79. *Trichopria semirufa* Kieffer, Insecta (1913), 3, 457. ♂.  
 80. *Trichopria insulæ* Kieffer, Insecta (1913), 3, 458. ♂.  
 81. *Ashmeadopria bakeri* Kieffer, Insecta (1913), 3, 458. ♂.  
 82. *Ashmeadopria nigriventris* Kieffer, Insecta (1913), 3, 459. ♂.  
 83. *Ashmeadopria bipunctata* Kieffer, Insecta (1913), 3, 459. ♂.  
 84. *Aparamesius carinatus* Kieffer, Insecta (1913), 3, 436. ♂, ♀.  
 85. *Aparamesius flicornis* Kieffer, Insecta (1913), 3, 437. ♂.  
 86. *Aparamesius levistilus* Kieffer, Insecta (1913), 3, 437. ♂.  
 87. *Aparamesius depressus* Kieffer, Insecta (1913), 3, 437. ♀.  
 88. *Spilomicrus carinifrons* Kieffer, Insecta (1913), 3, 438. ♂, ♀.  
 89. *Spilomicrus variicornis* Kieffer, Insecta (1913), 3, 439. ♀.  
 90. *Spilomicrus opertus* Kieffer, Insecta (1913), 3, 440. ♂.  
 91. *Spilomicrus dispansus* Kieffer, Insecta (1913), 3, 440. ♂.  
 92. *Spilomicrus nitidicornis* Kieffer, Insecta (1913), 3, 441. ♂.  
 93. *Spilomicrus consobrinus* Kieffer, Insecta (1913), 3, 441. ♀.  
 94. *Loboscelidia rufescens* Westwood, Thesaur. entom. Oxon. (1874), 172.

## BELYTIDÆ

95. *Aclista punctulata* Kieffer, Insect (1913), 3, 459. ♂, ♀.  
 96. *Xenotoma philippinensis* Kieffer, Insecta (1913), 3, 460. ♀.  
 97. *Procinetus rectinervis* Kieffer, Insecta (1913), 3, 461. ♂.



## DESCRIPTION DES NOUVELLES ESPÈCES ET DES NOUVEAUX GENRES

## BETHYLIDÆ

Genus **GONIOZUS** Foerster

Parmi les 26 espèces dont se compose ce genre, les trois suivantes reviennent aux Philippines :

1. Segment médian marginé latéralement et postérieurement, ayant sur la moitié antérieure de sa partie médiane un espace proéminent, triangulaire et lisse..... *G. triangulifer* sp. nov.
- Segment non marginé, sans espace relevé et triangulaire..... 2.
2. Tête plane, circulaire, entièrement lisse..... *G. depressus* Kieffer.
- Tête allongée, parsemée de points..... *G. philippinensis* Ashm.

*Goniozus triangulifer* sp. nov. (♂, ♀.)

Noir, brillant, mandibules, antennes, genoux, tibias et tarses, parfois les quatre fémurs postérieurs d'un jaune clair. Tête presque circulaire, très faiblement chagrinée, parsemée de points peu profonds. Clypeus fortement caréné. Yeux deux fois aussi longs que leur distance du bord occipital. Ocelles postérieurs touchant le bord occipital, plus éloignés des yeux que l'un de l'autre. Articles antennaires 3-5 chez le mâle ou seulement le 3<sup>e</sup> chez la femelle, un peu allongés, les suivants globuleux, sauf le 13<sup>e</sup> qui est allongé. Thorax très finement chagriné. Pronotum de moitié plus long que le mesonotum, sillons parapsidaux nuls. Scutellum avec un mince sillon transversal. Segment médian marginé latéralement et postérieurement, mat et chagriné, ayant dans la moitié antérieure de sa partie médiane un espace relevé, triangulaire, lisse et brillant, à pointe dirigée en arrière et reliée au bord postérieur par une arête longitudinale. Ailes hyalines, prostigma, stigma et radius bruns, les autres nervures jaunes, radius presque droit, recourbé à l'extrémité, basale brisée fortement en angle, sa partie inférieure plus longue que la supérieure. Abdomen lisse et brillant, segment anal incurvé chez le mâle, droit et à tarière proéminente chez la femelle.

Taille: 2.5-3 mm.

Localités: LUZON, Laguna, Los Baños et Mont Maquiling, et Manila.

Genus **EPYRIS** Westwood

*Epyris filiformis* sp. nov. (♀.)

Noir, lisse, brillant, glabre; mandibules, 4 ou 5 premiers articles antennaires, palpes, tibias et tarses roux, reste des antennes graduellement assombri. Corps très mince. Tête quadrangulaire, au moins deux fois aussi longue que large, convexe, beau-

coup plus large que le thorax, partie antérieure faiblement ponctuée, avec trace d'une ligne enfoncée longitudinale. Yeux glabres, allongés, grands, plus courts que l'occiput. Joues nulles. Front découpé en arc au bord antérieur. Clypeus situé plus bas que le front, fortement caréné. Mandibules médiocres, graduellement élargies, avec 3 ou 4 petites dents noires. Ocelle antérieur situé plus en arrière que le bord postérieur des yeux. Palpes courts, les maxillaires avec 3 petits articles après la flexion. Scape arqué, aussi long que les 3 ou 4 articles suivants réunis et guère plus gros, article 3<sup>e</sup> très transversal, les suivants un peu transversaux sauf le 13<sup>e</sup>, tous serrés. Thorax quatre à cinq fois aussi long que haut. Pronotum deux fois aussi long que large, trois fois aussi long que le mesonotum, sillons parapsidaux visibles seulement au tiers postérieur, élargis en virgule. Fossettes du scutellum séparées seulement par une arête. Segment médian horizontal, quadrangulaire et très long, deux fois et demie aussi long que large, densément strié en travers, marginé latéralement par deux arêtes séparées par une gouttière striée transversalement, bord postérieur non marginé, graduellement arrondi, mésopleures et métapleures densément ridées en long. Ailes subhyalines, atteignant le milieu de l'abdomen, sous-costale confondue avec la postale, sauf distalement, basale oblique et distante du stigma de ses deux tiers, transversale perpendiculaire, stigma obconique, guère plus long que large, radius à peine arqué, deux fois aussi long que la basale, sans autres nervures. Fémurs très élargis, les antérieurs en ellipse, articles 2-4 du tarse antérieur cordiformes et aussi larges que longs, crochets tarsaux ayant au moins une dent. Abdomen aussi long que le reste du corps ou plus long, mince, graduellement en pointu, terminé par un stylet, comme d'ordinaire, tarière proéminente.

Taille: 6 mm. sur une largeur n'atteignant pas 1 mm.

Localité: LUZON, Laguna, Mont Maquiling.

### SCELIONIDÆ

#### Genus *SCELIO* Latreille

Quatre espèces du genre *Scelio* étaient connues pour les Philippines; j'en ajoute deux nouvelles, qui se distinguent des précédentes d'après le tableau suivant.

- |  |                                |
|--|--------------------------------|
| 1. Sillons parapsidaux plus ou moins distincts.....  | 2.                             |
| Sillons parapsidaux nuls.....  | 3.                             |
| 2. Tête et thorax avec des points serrés et ombiliqués, scape jaune brunâtre, joues non striées..... | <i>S. philippinensis</i> Ashm. |

- Vertex et mesonotum lisses, avec de rares points non ombiliqués, scape noir, joues striées en partie..... *S. bisectus* sp. nov.
3. Joues striées..... 4.  
Joues réticulées comme le reste de la tête..... 5.
4. Front strié jusqu'au milieu des yeux, hanches et massue des fémurs d'un brun noir..... *S. aratigena* Kieff.  
Stries n'atteignant pas la base des yeux, hanches et pattes jaunes en entier..... *S. luzonicus* sp. nov.
5. Articles antennaires 3-5 rouges chez le mâle, scape de la femelle noir, hanches rousses..... *S. varicornis* Kieff.  
Antennes noires en entier chez le mâle, scape de la femelle roux, hanches noires..... *S. consobrinus* Kieff.

*Scelio bisectus* sp. nov. (♂.)

Noir; antennes brunes, scape noir, mandibules d'un brun noir, les 2 lobes aigus et longs, pattes d'un jaune sâle, hanches noires, massue des quatre fémurs postérieurs brune, tarse postérieur brunâtre. Tête à ponctuation grosse et dense. Yeux réunis aux mandibules par un sillon. Bas du front strié de chaque côté, ces stries ne dépassent pas le sillon et n'atteignent pas ou à peine la base des yeux; fossette frontale remplacée par un petit espace lisse et brillant au-dessus du tubercule antennaire. Vertex brillant, lisse, à points épars et peu gros. Ocelles postérieurs distants des yeux de moins de leur diamètre. Article 3<sup>e</sup> des antennes obconique, plus gros et un peu plus long que le 2<sup>e</sup>, à peine plus long que gros, 4<sup>e</sup> obconique et transversal, 5<sup>e</sup> très gros, transversal, 6-10 également minces, serrés, très transversaux sauf le 10<sup>e</sup>, qui est ovoïdal. Thorax glabre. Pronotum ponctué densément. Mesonotum lisse, brillant, avec quelques rares points peu gros; sillons parapsidaux percurrents, profonds, divergents en avant, lobe médian du mesonotum plus large en arrière que les latéraux. Scutellum ponctué grossièrement en dé. Metanotum à arêtes longitudinales formant des fossettes, milieu en forme de tubercule peu apparent. Segment médian à grosses rides longitudinales. Pleures ridées en long et ponctué, sans espace lisse. Ailes faiblement enfumées, sous-costale jaune, marginale circulaire, d'un brun noir, stigmatique d'un brun clair, presque perpendiculaire. Métatarse postérieur un peu plus long que les articles 2 et 3 réunis. Abdomen en ellipse allongé, déprimé, un peu dépassé par les ailes, arrondi en arrière, tous les tergites transversaux, striés en long avec le bord postérieur lisse, 6<sup>e</sup> et 7<sup>e</sup> seulement ponctué densément, les trois premiers graduellement plus longs.

Taille: 4.5 mm.

Localité: LUZON, Laguna, Los Baños.

*Scelio luzonicus* sp. nov. (♀.)

Noir; mandibules d'un brun noir, les 2 lobes aigus et peu longs, pattes jaunes, hanches plus sombres à la base. Tête à poils blancs, appliqués, courts, plus denses sur les tempes, grossièrement réticulée, sauf à la base du front qui est striée en long de chaque côté, ces stries ne dépassent pas le sillon qui réunit l'œil à la mandibule et n'atteignent pas ou à peine la base de l'œil. Fossette frontale comme chez le précédent. Antennes noires en entier, 3<sup>e</sup> article obconique, bien plus long que le 2<sup>e</sup>, deux fois aussi long que gros ou que le 3<sup>e</sup>. Thorax à poils plus rares que sur la tête, grossièrement réticulé, sans sillons parapsidaux, les pleures plutôt ridées-punctuées. Ailes faiblement enfumées, subhyalines à la base, nervures très pâles. Abdomen comme chez le précédent sauf que le 6<sup>e</sup> ou dernier segment est chagriné, triangulaire, aussi long que large.

Taille: 6 mm.

Localité: LUZON, Laguna, Mont Maquiling.

Genus *UROSCELIO* novum

♀. Yeux glabres. Mesonotum avec 2 sillons parapsidaux. Postmarginale plus longue que la stigmatique. Thorax inerme. Abdomen avec une corne, 6<sup>e</sup> segment subitement aminci et formant une longue queue. Le type est:

*Uroscelio luteipes* sp. nov. (♀.)

Noir; mandibules, antennes sauf les 5 derniers articles, hanches et pattes d'un jaune sâle, abdomen brun noir, marge latérale plus claire. Tête glabre, brillante, presque deux fois aussi large que longue vue d'en haut, beaucoup plus haute que longue vue de côté, un peu plus large que le thorax. Ocelles en triangle, les postérieurs distants des yeux de leur diamètre, beaucoup plus distants du bord postérieur que de l'antérieur. Joes lisses, égalant la moitié des yeux, avec une ponctuation assez grosse et assez dense et un profond sillon. Tempes larges, graduellement élargies par en bas, lisses, avec une ponctuation plus éparsée que celle des joes. Vertex strié ou ridé densément en long. Front strié transversalement en arc, sans fossette, à peine déprimé au milieu. Antennes avec une massue de 6 articles, scape subcylindrique, un peu plus long que les articles 2 et 3 réunis, article 2<sup>e</sup> obconique, deux fois aussi long que gros, 3<sup>e</sup> égal au 4<sup>e</sup>, subcylindrique, presque double du 2<sup>e</sup>, 5<sup>e</sup> un peu plus court que le 4<sup>e</sup> et à peine plus gros, encore trois fois aussi long que gros, 6<sup>e</sup> un peu plus gros que le 5<sup>e</sup>, de moitié plus long que gros, 7<sup>e</sup> à peine plus

long que gros, formant le commencement de la massue, plus gros que le 6<sup>e</sup> mais moins gros que le 8<sup>e</sup>, 7-11 presque transversaux et serrés, 12<sup>e</sup> un peu allongé. Thorax peu convexe, mesonotum et scutellum mats, chagrinés, finement pubescents. Pronotum à peine visible d'en haut, mesonotum semicirculaire, sillons parapsidaux percurrents, peu divergents en avant, bord postérieur du lobe médian deux fois aussi large que les latéraux. Scutellum transversal, séparé du mesonotum par une rangée transversale de fossettes, bord postérieur marginé par des fossettes plus petites. Metanotum transversal, plus long que la moitié du scutellum, grossièrement cannelé en long, inerme. Segment médian découpé en trapèze jusqu'à sa base. Propleures avec un espace elliptique traversé par des arêtes longitudinales; méso-pleures très excavées, lisses et brillantes. Ailes à peine teintées, pubescentes, ciliées, atteignant le milieu du 5<sup>e</sup> tergite, sous-costale brune et située contre le bord, les autres nervures pâles, basale très oblique, marginale plus courte que la stigmatique, qui est oblique, longue, noueuse au bout, postmarginale plus de deux fois aussi longue que la stigmatique. Pattes grêles, tibia postérieur beaucoup plus long que le fémur, métatarse postérieur très long, deux fois aussi long que les 4 suivants réunis. Abdomen deux fois aussi long que le reste du corps, brillant; pétiole presque deux fois aussi long que large, linéaire, grossièrement cannelé, avec une corne obtuse striée transversalement en arc et s'engageant entre les deux lobes du segment médian, segments 2-5 formant un fuseau, le 2<sup>e</sup> un peu plus long que le 1<sup>er</sup>, graduellement élargi, grossièrement cannelé en avant, finement strié dans le reste, de moitié plus long que large, 3<sup>e</sup> à peine transversal, égalant les deux suivants réunis, finement ridé en long et ponctué, 4<sup>e</sup> et 5<sup>e</sup> très transversaux, le 4<sup>e</sup> un peu plus long que le 5<sup>e</sup>, tous deux densément ponctués, 6<sup>e</sup> tergite subitement aminci, beaucoup plus étroit que le 5<sup>e</sup>, formant une queue linéaire, déprimée, pubescente, presque aussi longue que les 3 tergites précédents réunis, côtés de l'abdomen faiblement pubescents.

Taille: 4.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

Genus **HOPLOTELEIA** Ashmead

*Hoploteleia carinata* Kieff.

On ne connaissait de cette espèce que la femelle. Le mâle diffère par les antennes qui sont d'un jaune rougeâtre et assez

grosses, 2<sup>e</sup> article très petit, 3<sup>e</sup> presque deux fois aussi long que le 2<sup>e</sup>, plus long que le 4<sup>e</sup>, 4-11 un peu plus gros que le 3<sup>e</sup>, à peine plus longs que gros, le 5<sup>e</sup> avec une minime dent latérale, 12<sup>e</sup> allongé. Tête seulement de moitié plus large que longue. Abdomen aussi long que le reste du corps, sculpté comme chez la femelle, sauf que le 3<sup>e</sup> tergite est ponctué densément, les suivants plus finement ponctués, le 7<sup>e</sup> très court, tronqué en arrière, avec une minime dent à chaque angle postérieur. Métatarse postérieur grossi. Pubescence du corps faible, peu apparente, jaunâtre.

Taille: 4 mm.

Localités: LUZON, Laguna, Los Baños, Mont Maquilung.

#### Genus *DILAPITHA* novum

Voisin de *Neuroteleia* Kieff., dont il diffère surtout par la présence des sillons parapsidaux. Le type est *D. albipes* sp. nov.

1. Thorax brun noir, brillant..... *D. nitida* sp. nov.  
 Thorax roux mat, avec une bande longitudinale d'un brun noir.  
*D. albipes* sp. nov.

#### *Dilapitha albipes* sp. nov. (♂.)

Noir; thorax roux, lobe médian du mesonotum sauf l'extrémité antérieure, scutellum, metanotum et milieu du segment médian noirs, hanches postérieures et toutes les pattes blanchâtres, les hanches antérieures brunes, mandibules rousses, antennes d'un brun noir, scape blanc sâle, sauf l'extrémité. Tête presque deux fois aussi large que longue, densément striée ou ridée en travers sur le dessus. Yeux glabres, marginés au côté médian. Joues petites, striées, avec un sillon. Antennes grêles, filiformes, scape à peine plus gros que le flagellum, 2<sup>e</sup> article globuleux, 3-6 subégaux, cylindriques, trois fois aussi longs que gros, les suivants graduellement raccourcis, le 10<sup>e</sup> de moitié plus long que gros, flagellum pubescent. Thorax un peu plus long que haut. Pronotum non visible d'en haut. Mesonotum transversal, mat, très finement ponctué ou chagriné comme le scutellum, sillons parapsidaux percurrents, faiblement divergents en avant. Scutellum séparé du mesonotum par une ligne crénelée, arrondi en arrière. Metanotum armé de deux petites dents séparées par une incision arquée. Segment médian graduellement déclive. Ailes dépassant l'abdomen, pubescentes, ciliées, faiblement teintées, nervures pâles, sous-costale proche du bord, marginale très courte, stigmatique longue, oblique, deux

fois aussi longue que la marginale, radius oblique, trois fois aussi long que la stigmatique, formant avec la postmarginale une longue cellule radiale fermée, basale arquée, formant avec la médiane une cellule basale fermée, deux autres nervures longitudinales parcourent la moitié distale de l'aile. Abdomen déprimé, à peine plus long que le reste du corps, arrondi en arrière, spatulé, pétiole à bords parallèles, à peine transversal, 2<sup>e</sup> segment allongé, graduellement élargi, tous deux striés en long et avec des fossettes le long du bord antérieur, 3<sup>e</sup> tergite transversal, à peine plus courte que le 2<sup>e</sup>, mat et ponctué densément comme les trois suivants.

Taille: 2.5 mm.

Localité: LUZON, Laguna, Los Baños.

*Dilapitha nitida* sp. nov. (♂.)

Noir; thorax brun noir, mandibules devant du scape et pattes d'un jaune sâle, hanches d'un brun jaune. Tête aussi large que le thorax, très transversale, glabre, brillante, grossièrement striée en travers. Tempes étroites, lisses et finement ponctuées. Joux égalant le tiers des yeux, striées en éventail, une arête va de l'ocelle externe, le long du bord interne de l'œil, et traverse ensuite la joue jusqu'aux mandibules, entre les antennes se trouve une fine carène qui se prolonge encore en arrière. Front à peine déprimé, avec des stries arquées et transversales mais sans fossette. Yeux glabres. Ocelles postérieurs situés contre les yeux. Scape subcylindrique, un peu plus long que les deux suivants réunis, 2<sup>e</sup> obconique, guère plus long que gros, 3-12 cylindriques, pubescents, graduellement raccourcis, le 3<sup>e</sup> presque trois fois aussi long que gros, 11<sup>e</sup> pas deux fois aussi long que gros, plus court que le 12<sup>e</sup>, le 5<sup>e</sup> avec une petite dent avant le milieu. Thorax à peine plus long que haut, pronotum non visible d'en haut, mesonotum transversal, fortement convexe, brillant et très finement ponctué comme le scutellum, lobe médian un peu moins large en arrière que les latéraux, sillons parapsidaux convergents faiblement en arrière. Scutellum transversal, séparé du mesonotum par une rangée de fossettes, des fossettes semblables sont alignées le long de son bord postérieur. Metanotum petit, cannelé, les deux dents petites et rapprochées. Segment médian transversal. Propleures avec un espace elliptique bordé en avant de fossettes alignées, mésopleures bordées en arrière de fossettes alignées. Ailes un peu brunies, dépassant beaucoup l'abdomen, sous-costale distante du bord, basale oblique, distante de la marginale de sa longueur, marginale

deux fois aussi longue que large, n'ayant que la moitié de la stigmatique qui est oblique et noueuse au bout, postmarginale deux à trois fois aussi longue que la stigmatique, radius oblique, atteignant le bord un peu en arrière de la postmarginale, récurrente, courte, continuant la direction du radius, anale percurrente. Abdomen déprimé, à peine plus long que le reste du corps, spatulé, pétiole un peu transversal, cannelé, à fossettes en avant, 2<sup>e</sup> tergite graduellement élargi, un peu plus long que le 3<sup>e</sup>, strié, avec des fossettes en avant, 3<sup>e</sup> à peine plus court que les 3 suivants réunis, ponctué densément comme les suivants, tous les tergites transversaux.

Taille: ♂, 2.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

### Genus APEGUS Foerster

#### *Apegus maquilingensis* sp. nov. (♀.)

Noir mat; antennes et pattes sauf les hanches d'un jaune vitellin. Tête un peu transversale, à ponctuation éparsée et superficielle. Yeux glabres. Ocelles postérieurs distants des yeux de moins de leur diamètre. Joues striées, séparées de la face par un sillon. Fosse frontale profonde, lisse, brillante, marginée, trois fois aussi large que sa distance du bord oculaire. Article 2<sup>e</sup> des antennes à peine plus long que gros, 3<sup>e</sup> deux fois aussi long que gros, obconique comme le 4<sup>e</sup>, et un peu plus long que lui, 2-4 également minces, les suivants distinctement grossis, le 5<sup>e</sup> obconique, un peu plus long que gros, 6-12 subglobuleux ou un peu transversaux et bien séparés. Thorax peu convexe, chagriné dorsalement. Sillons parapsidaux percurrents, divergents en avant. Scutellum séparé du mesonotum par un sillon, son bord postérieur arrondi et précédé de gros points alignés. Metanotum inerme. Ailes légèrement jaunâtres, nervures pâles, sous-costale éloignée du bord, marginale petite, presque pontiforme, stigmatique longue, oblique, noueuse au bout, postmarginale deux fois aussi longue que la stigmatique. Abdomen un peu plus long que le reste du corps, déprimé, presque d'égale largeur sauf aux deux extrémités qui sont un peu moins larges, les trois premiers tergites graduellement plus longs, 1<sup>er</sup> et 2<sup>e</sup> striés, avec des fossettes le long du bord antérieur, transversaux, 3<sup>e</sup> presque aussi long que large, mat et densément ponctué comme les suivants qui sont transversaux.

Taille: 3.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.



Genus **CAMPTOTELEIA** Kieffer

Les espèces dont se compose ce genre se répartissent de la façon suivante:

1. Front sans impression; metanotum à deux dents aiguës et se touchant presque à la base..... *C. carinata* Kieff.  
Front avec une profonde impression; metanotum avec une dent unique excavée dorsalement..... 2.
2. Dent du metanotum longue, égalant les deux tiers du scutellum.  
*C. magna* sp. nov.  
Dent du metanotum petite, large, un peu transversale..... 3.
3. Mesonotum et scutellum grossièrement ridés en travers.  
*C. flavipennis* sp. nov.  
Mesonotum et scutellum brillants et lisses, à points épars et fins..... 4.
4. Ailes brunes, abdomen aminci graduellement et fortement en arrière, 2<sup>e</sup> tergite réticulé, 3-7 striés, sans ponctuation..... *C. excavata* Kieff.  
Ailes subhyalines, abdomen faiblement aminci en arrière, tergites 2-7 grossièrement ponctués entre les arêtes..... *C. cupularis* sp. nov.

**Camptoteleia magna** sp. nov. (♀.)

Noir; mandibules jaunes, antennes sauf la massue, hanches et pattes d'un jaune sâle, tarse postérieur brun. Tête, vue d'en haut, subglobuleuse, à peine transversale, grossièrement ridée en travers, intervalles des rides formant des gros points ocellés. Yeux grands, glabres; ocelles en triangle, les postérieurs touchent les yeux. Vertex depuis l'ocelle postérieure jusqu'à l'excavation frontale formant un espace deux fois aussi long que large, à bords parallèles; bord postérieur du vertex marginé en arc comme le bord postérieur des yeux, puis déclive obliquement en arrière, cette partie oblique à gros points ocellés. Tempes graduellement et fortement élargies par en bas, leur bord postérieur aigu et marginé. Joues ayant le tiers de la longueur des yeux, avec un large sillon. Excavation frontale profonde, plus de quatre fois aussi large que sa distance du bord oculaire, lisse et brillant, sa partie supérieure striée en arc transversalement, son extrémité supérieure arquée et marginée. Antennes avec une massue de sept articles, scape aussi long que les trois articles suivants réunis, 2<sup>e</sup> article deux fois aussi long que gros, 3<sup>e</sup> de moitié plus long que le 2<sup>e</sup>, 4<sup>e</sup> plus court que le 2<sup>e</sup>, 5<sup>e</sup> un peu plus court que le 3<sup>e</sup> et à peine plus gros, 6-12 subitement grossis et serrés, le 6<sup>e</sup> moins gros que les suivants, qui sont un peu transversaux, sauf le dernier. Pronotum nul au milieu, le bord dorsal du prothorax étant formé par le col, situé plus bas que le mesonotum; celui-ci un peu allongé, brillant, pubescent, à points épars et fins, arête médiane traversant

encore le scutellum, sillons parapsidaux divergents en arrière. Scutellum grand, atteignant presque la demi-longueur du mesonotum, arrondi en arrière et ponctué comme le mesonotum, bord postérieur relevé, tranchant et séparé du disque par un enfoncement en forme de gouttière, qui est traversé par de courtes arêtes longitudinales. Metanotum très court, parcouru par des arêtes, armée d'une dent horizontale, longue, atteignant les deux tiers du scutellum, graduellement amincie et profondément excavée dorsalement. Segment médian court, parcouru par des arêtes, divisé au milieu, jusqu'à sa base, en deux lobes. Pleures ridées en long, mésopleures très excavées, propleures avec un long espace elliptique marginé. Ailes jaunes, atteignant le segment anal, sous-costale éloignée du bord, marginale ponctiforme, postmarginale nulle, stigmatique oblique, longue, noueuse au bout. Abdomen un peu plus long que le reste du corps, aussi large que le thorax, graduellement aminci en arrière, composé de 6 segments transversaux, sauf le 6<sup>e</sup> qui est triangulaire, et aussi long que large, les trois premiers graduellement plus longs, striés en long comme les autres.

Taille: ♀, 6 mm.

Localité: LUZON, Laguna, Mont Maquiling.

*Camptoteleia flavipennis* sp. nov. (♂.)

Noir; scape, hanches et pattes jaunes. Tête sans arête transversale en arrière des ocelles, non déclive obliquement en arrière mais découpée en arc, grossièrement ridée-ponctuée, vertex ridée en travers, joues à sillon, yeux non marginés, fossette frontale comme chez le précédent mais non striée. Antennes filiformes; scape un peu plus long que les articles 2 et 3 réunis, lisse et glabre comme le 2<sup>e</sup>, les suivants pubescents et mats, le 3<sup>e</sup> un peu plus long que le 2<sup>e</sup>, 4-11 cylindriques, aussi longs que le 2<sup>e</sup> mais plus gros, à peine aussi longs que gros, le 5<sup>e</sup> avec une minime dent au milieu du bord externe, 12<sup>e</sup> plus long que le 11<sup>e</sup>. Thorax conformé comme chez le précédent, sauf la sculpture et la dent du metanotum; sa partie dorsale est grossièrement ridée en travers, la dent du metanotum est petite, large, un peu transversale, excavée dorsalement et cupuliforme. Ailes jaunes, atteignant le segment anal, nervures brunes, conformées comme chez le précédent. Abdomen à peine plus long que le reste du corps, graduellement et fortement aminci en arrière à partir du milieu, les deux derniers segments n'ayant pas la demi-largeur du second, le premier strié, les suivants grossièrement réticulés, 3<sup>e</sup> et 4<sup>e</sup> aussi

longs que larges, les autres transversaux, 6<sup>e</sup> et 7<sup>e</sup> deux fois aussi larges que longs, sans appendices.

Taille: ♂, 3.8 mm.

Localité: LUZON, Laguna, Los Baños.

*Camptoteleia cupularis* sp. nov. (♂.)

Noir; scape, hanches et pattes d'un jaune pâle, antennes brunes, tarse postérieur assombri. Tête grossièrement ponctuée, les points non ocellés, vertex ridé en travers. Article 3<sup>e</sup> des antennes deux fois aussi long que le 2<sup>e</sup>, distinctement plus long que le 4<sup>e</sup>, 4-12 cylindriques, un peu allongés, subégaux sauf le 12<sup>e</sup> qui est plus long que le 9<sup>e</sup>. Mesonotum et scutellum brillants, à points épars et fins, dent du metanotum cupuliforme comme chez le précédent. Ailes subhyalines, nervures jaunes. Abdomen de moitié plus long que le reste du corps, tergites striés en long, 2-7 non lisses et brillants entre les arêtes mais grossièrement ponctués et mats, le 3<sup>e</sup> le plus long, faiblement allongé, 2<sup>e</sup> et 8<sup>e</sup> aussi long que larges, les autres transversaux, le 7<sup>e</sup> tronqué, avec une dent à peine perceptible à chaque angle postérieur.

Taille: ♂, 5.5 mm. Pour le reste, semblable au précédent.

Localité: LUZON, Laguna, Mont Maquilang.

#### Genus **MACROTELEIA** Westwood

Les représentants de ce genre dans les îles Philippines se distinguent comme il suit:

1. Scutellum muni, en arrière, de deux bouquets de longs poils blancs, ligne dorsale du 6<sup>e</sup> tergite fortement arquée..... *M. manilensis* Ashm.  
Scutellum sans bouquets de poils, ligne dorsale du 6<sup>e</sup> tergite droite..... 2.
2. Thorax densément pubescent dorsalement et mat; impression frontale très faible, mate et ponctuée sauf le centre, 7<sup>e</sup> tergite dépassant de moitié le 7<sup>e</sup> sternite..... *M. superans* sp. nov.  
Thorax presque glabre, impression frontale profonde, lisse et brillante.. 3.
3. Postmarginale guère plus longue que la marginale, 2<sup>e</sup> et 3<sup>e</sup> tergites de la ♀ d'égale longueur.... *M. crawfordi* Kieff. (*M. kiefferi* Crawf. non Brues).  
Postmarginale au moins deux fois aussi longue que la marginale..... 4.
4. Impression frontale moins large que sa distance des yeux, tête et mesonotum densément ponctués, 6<sup>e</sup> tergite de la ♀ comprimé et plus long que le 5<sup>e</sup>..... *M. striativentris* Crawf.  
Impression frontale au moins deux fois aussi large que sa distance des yeux, 6<sup>e</sup> tergite de la ♀ déprimé comme les autres, plus court que le 5<sup>e</sup>, tous deux transversaux..... 5.
5. Tête lisse, à ponctuation superficielle, éparse et peu distincte.  
*M. philippinensis* Kieff.  
Tête à points gros et serrés..... *M. cavifrons* sp. nov.

**Macroteleia superans** sp. nov. (♂.)

Noir, mat; scape, hanches et pattes d'un jaune clair, reste des antennes d'un jaune brunâtre. Tête de moitié plus large que longue, pubescente, ponctuée densément et assez finement, tempes ridées en long ou réticulées. Fossette frontale remplacée par une faible dépression non marginée, moins large que sa distance des yeux, mate et ponctuée, sauf un petit espace lisse au centre. Joues à sillon, mesurant le quart des yeux, ceux-ci glabres. Ocelles postérieurs distants de l'œil de leur diamètre. Scape un peu arqué, à peine plus court que les articles 2 et 3 réunis, 2<sup>e</sup> un peu plus mince que les suivants, obconique, deux fois aussi long que gros, 3<sup>e</sup> trois fois aussi long que gros, 4–11 cylindriques, allongés mais moins que le 2<sup>e</sup>, le 5<sup>e</sup> avec une dent latérale, 12<sup>e</sup> plus long que le 11<sup>e</sup>. Thorax dorsalement plus fortement pubescent de gris que la tête, de sorte que sa ponctuation, qui est plus fine que celle de la tête, est à peine perceptible. Pronotum aussi élevé que le mesonotum, profondément découpé au milieu et seulement ponctiforme à cet endroit. Mesonotum allongé, sillons parapsidaux percurrents, très divergents en avant. Ailes un peu jaunâtres, nervures jaunes, marginale aussi longue ou à peine plus longue que la stigmatique, postmarginale presque triple de la stigmatique, celle-ci oblique, longue, noueuse au bout. Segment médian glabre, ridé en long, tronqué postérieurement, sans incision et sans dents. Pleures subglabres, rugueuses, mésopleures cannelées supérieurement, enfoncées, lisses et brillantes dans la moitié inférieure. Métatarse plus de deux fois aussi long que le 2<sup>e</sup> article, égalant les 3 suivants réunis. Abdomen presque deux fois aussi long que le reste du corps, fusiforme, les 7 tergites allongés, le 1<sup>er</sup> d'un tiers plus long que large, 2<sup>e</sup> un peu plus court que le 3<sup>e</sup>, qui est deux fois aussi long que large, 4<sup>e</sup> à peine plus court que le 2<sup>e</sup>, plus long que le 1<sup>er</sup>, 5<sup>e</sup> plus long que le 6<sup>e</sup>, un peu plus court que le 4<sup>e</sup>, 6<sup>e</sup> égal au 1<sup>er</sup>, 7<sup>e</sup> mince, en pointe triangulaire, un peu plus long que large; vu de côté le 7<sup>e</sup> tergite dépasse de sa demi-longueur le 7<sup>e</sup> sternite; les 4 premiers tergites sont striés en long, 5<sup>e</sup> faiblement ridé en long, 6<sup>e</sup> et 7<sup>e</sup> mats et chagrinés, vus de côté, leur ligne dorsale est droite.

Taille: ♂, 6.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

**Macroteleia cavifrons** sp. nov. (♀.)

Noir, brillant; scape, hanches et pattes d'un jaune sâle, tarse postérieur noir. Tête presque deux fois aussi large que longue,

avec des points gros et denses, sauf dans la fossette du front, qui est profonde, lisse, et atteignant presque les yeux. Joues très petites, avec un sillon. Ocelles en triangle, les postérieurs sont distants des yeux de moins de leur diamètre. Thorax conformé comme chez le précédent, sauf la sculpture; mesonotum presque lisse, avec une ponctuation très fine et peu distincte, bord antérieur à gros points alignés, sillons parapsidaux divergents en avant. Scutellum transversal, presque lisse. Metanotum grossièrement sculpté, égalant le tiers du scutellum. Segment médian petit, découpé, les angles en forme de petite dent. Propleures avec l'espace elliptique ordinaire. Ailes hyalines, marginale égalant la stigmatique, atteignant le tiers de la postmarginale, stigmatique oblique, longue, avec un nœud au bout. Métatarse postérieur égalant au moins les 4 articles suivants réunis. Abdomen à peine deux fois aussi long que le reste du corps, fusiforme, les 5 premiers tergites grossièrement striés en long, 6<sup>e</sup> et 7<sup>e</sup> chagrinés et mats, tous déprimés, le 1<sup>er</sup> un peu allongé, plus court que le 2<sup>e</sup>, 2-4 subégaux, au moins aussi longs que larges, 5<sup>e</sup> et 6<sup>e</sup> à peine transversaux, 7<sup>e</sup> très petit.

Taille: ♀, 6 mm.

Localité: LUZON, Laguna, Los Baños.

**Macroteleia flaviceps** sp. nov. (♂.)

Noir; tête jaune et mate, alentours des ocelles assombris, scape, hanches, pattes et thorax sauf le dessus d'un jaune mat, milieu des tergites 2-4 et des sternites 2-4 d'un jaune roussâtre, flagellum brun. Tête découpée en arc postérieurement, grosse, un peu transversale, lisse ou à peine chagrinée. Tempes très larges, aussi larges que les yeux. Joues égalant les deux tiers des yeux, traversées par un sillon. Ocelles postérieurs touchant presque les yeux. Scape aussi long que les trois articles suivants réunis, articles 2 et 3 obconiques, au moins de moitié plus longs que gros, 4-11 égaux, cylindriques, à peine plus longs que gros, le 5<sup>e</sup> un peu grossi, le 4<sup>e</sup> un peu plus court que le 6<sup>e</sup>, 12<sup>e</sup> faiblement allongé. Mesonotum plan, allongé, mat, pubescent, avec une ponctuation médiocre et dense, sillons parapsidaux percurrents, fortement convergents en arrière. Scutellum transversal, sculpté comme le mesonotum, tronqué en arrière, bordé postérieurement par des fossettes. Metanotum à peine visible. Segment médian horizontal, transversal, tronqué en arrière. Ailes subhyalines, atteignant le milieu du 4<sup>e</sup> tergite, sous-costale

éloignée du bord, marginale plus longue que la stigmatique, celle-ci oblique, médiocrement longue, noueuse au bout, post-marginale presque triple de la stigmatique, basale nulle. Métatarse postérieur un peu plus court que les 4 articles suivants réunis. Abdomen deux fois et demie aussi long que le reste du corps, plus étroit que le thorax, presque linéaire, sauf que les 3 derniers segments sont un peu plus étroits, tous allongés, 1-3 graduellement plus longs, le 3<sup>e</sup> deux fois aussi long que large, tous trois striés, leurs bords latéraux avec une arête marginale plus forte, 4<sup>e</sup> égal au 2<sup>e</sup>, 5-7 graduellement raccourcis, ridés en long ou finement chagrinés et pubescents.

Taille: 4.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

### DIAPRIIDÆ

#### Genus **PARAMESIUS** Westwood

**Paramesius luzonicus** sp. nov. (♂.)

Noir, lisse et brillant; flagellum roux brun, mat et pubescent, mandibules, hanches et pattes d'un roux sombre, palpes blanchâtres. Tête un peu transversale vue d'en haut, plus haute que longue vue de côté, sans ponctuation. Yeux glabres. Joues sans sillon. Palpes maxillaires ayant après la flexion 3 articles dont le 1<sup>er</sup> est très petit, le 2<sup>e</sup> comprimé et triangulaire, tous deux réunis aussi longs que celui qui précède la flexion, le dernier un peu plus long que l'avant-dernier. Antennes aussi longues que le corps, scape cylindrique, égalant le 3<sup>e</sup> article, le 2<sup>e</sup> glabre, brillant, globuleux, mince comme les suivants, 3<sup>e</sup> quatre fois aussi long que le 2<sup>e</sup>, 3-13 graduellement amincis et raccourcis, le 12<sup>e</sup> plus de deux fois aussi long que gros, égal au 13<sup>e</sup>. Sillons parapsidaux percurrents, divergents en avant, lobe médian du mesonotum un peu plus large en arrière que les lobes latéraux, ceux-ci faiblement déprimés, avec une fossette allongée près du bord externe. Scutellum avec deux fossettes séparées par une arête. Segment median avec une dent pointue mais petite. Ailes faiblement brunies, dépassant un peu l'abdomen, brièvement ciliées, sous-costale atteignant le milieu, marginale guère plus longue que large, stigmatique oblique, égale à la marginale, récurrente indiquée par une trace, basale indiquée par un trait à peine perceptible, arqué et distant de la marginale de moins de sa longueur. Thorax brièvement ovoïdal, guère plus long que haut. Tiers distal du tibia postérieur subitement grossi. Pétiole

égalant la demi-longueur de l'abdomen, trois fois aussi long que gros, cannelé; abdomen en ellipse allongée, déprimé, graduellement aminci en avant jusqu'au pétiole, 2<sup>e</sup> tergite occupant les  $\frac{4}{5}$ , 2<sup>e</sup> sternite occupant les  $\frac{3}{4}$  de l'abdomen.

Taille: 3.6 mm.

Localité: LUZON, Laguna, Mont Maquiling.

### Genus **SPILOMICRUS** Westwood

Ce genre comprenait 5 espèces dans les îles Philippines; nous y ajoutons une sixième.

1. Sillons parapsidaux percurrents..... 2.
- Sillons parapsidaux nuls ou marqués seulement en arrière, tête sans ponctuation..... 3.
2. Tempes et joues ponctuées..... *S. carinifrons* Kieff.
- Tête sans ponctuation..... *S. philippinensis* sp. nov.
3. Scutellum ayant, outre les 2 fossettes basales, une fossette latérale allongée et une rangée de points au bord postérieur..... 4.
- Scutellum sans fossettes latérales ni postérieures; sillons parapsidaux formant seulement un point allongé..... *S. varicornis* Kieff.
4. Yeux reliés aux mandibules par un sillon, sillons parapsidaux marqués au tiers postérieur..... *S. opertus* Kieff.
- Yeux non reliés aux mandibules par un sillon, les sillons parapsidaux forment seulement un point allongé au bord postérieur..... 5.
5. Flagellum roux brun, tergites ne couvrant pas les sternites.
- S. dispansus* Kieff.
- Flagellum noir brillant et plus gros, tergites couvrant les sternites.
- S. nitidicornis* Kieff.

#### *Spilomicrus philippinensis* sp. nov. (♂.)

Noir; flagellum brun noir, hanches et pattes d'un jaune brunâtre. Tête non ponctuée, lisse comme le reste du corps. Yeux velus. Antennes filiformes, 2<sup>e</sup> article globuleux, 3<sup>e</sup> plus court que le scape, presque trois fois aussi long que gros, 4<sup>e</sup> non échancré, 12<sup>e</sup> encore deux fois aussi long que gros, plus court que le 13<sup>e</sup>; pubescence fine. Sillons parapsidaux percurrents, fortement divergents en avant. Scutellum avec 2 fossettes basales séparées par une arête, fossettes latérales petites et minces. Segment médian avec une petite dent pointue. Ailes ciliées, sous-costale parallèle à la costale, dépassant un peu le tiers basal de l'aile, marginale pas plus longue que large, stigmatique oblique, un peu plus longue que la marginale, basale faiblement marquée, arquée. Pétiole presque deux fois aussi long que gros, strié; abdomen déprimé, en ellipse, relevé à sa base, dépassé de beaucoup par les ailes.

Taille: 2 mm.

Localité: LUZON, Laguna, Los Baños.

Genus **DIGALESUS** novum

Semblable à *Galesus*, dont il diffère par le scape non bispinuleux, par les antennes de 13 articles et les ailes pourvues d'une sous-costale, d'une marginale et d'une stigmatique. Le type est:

*Digalesus flavipes* sp. nov. (♂.)

Noir, lisse et brillant, flagellum brun sombre et pubescent, pattes jaunes, hanches assombries, moitié postérieure des tempes, devant du prothorax et métapleures, avec un feutrage blanchâtre. Tête allongée, presque droite dessus et dessous, déclive presque verticalement en avant, plus longue dorsalement que haute, ventralement encore plus longue et prolongée en un bec formé par les mandibules et atteignant le prosternum; vertex avec 2 arêtes longitudinales qui atteignent les ocelles, ceux-ci groupés en triangle, se touchant et situés au bord antérieur de la tête; une carène médiane descend de l'ocelle antérieur jusque entre les antennes en s'élevant graduellement, l'arête qui contourne le bord des yeux se prolonge en carène parallèle à la carène médiane et s'arrête brusquement en forme de dent, comme la médiane; lamelle frontale prolongée encore au-delà de la tête, bilobée et portant les antennes. Scape long, un peu arqué, subcylindrique, sans spinules à son extrémité, à peine plus long que le 3<sup>e</sup> article, 2<sup>e</sup> article de moitié plus long que gros, 3<sup>e</sup> presque triple du 2<sup>e</sup>, au moins de moitié plus long que le 4<sup>e</sup>, 5<sup>e</sup> un peu plus court que le 4<sup>e</sup>, un peu plus long que le 6<sup>e</sup>, 6-12 égaux, cylindriques, de moitié plus longs que gros, 13<sup>e</sup> plus long que le 12<sup>e</sup>. Pronotum profondément découpé en arrière; mesonotum un peu transversal, sillons parapsidaux larges, faiblement convergents en arrière, où ils sont distants de deux fois leur largeur. Scutellum allongé, fossettes antérieures allongées, séparées par une arête, un peu plus courtes que les fossettes latérales, fossettes du bord postérieur ponctiformes. Segment médian à 3 arêtes parallèles, angles postérieurs prolongés en dent. Ailes jaunâtres, costale nulle, sous-costale brune, atteignant presque le milieu de l'aile, marginale carrée, stigmatique oblique, pas plus longue que la marginale, un trait brunâtre indique une trace de récurrente oblique, bords non ciliés. Tibias graduellement et faiblement renflés. Pétiole deux fois aussi long que gros, subcylindrique, avec 3 fortes arêtes dorsales; abdomen ellipsoïdal, déprimé, grand tergite occupant un peu plus des deux tiers antérieurs, à sillon traversant le tiers antérieur, les quatre suivants graduellement raccourcis.

Taille: 3.5 mm.

Localité: LUZON, Laguna, Los Baños.



Genus **HEMIGALESUS** Kieffer

Les espèces qui forment ce genre sont particulières aux Philippines; elles se distinguent de la façon suivante:

1. Les deux spinules externes de la tête sont pointues et plus longues que larges..... 2.  
Les deux spinules externes sont en forme de lamelle un peu transversale et arrondie..... 5.
2. Mesonotum fortement convexe dans sa partie médiane, déprimé ou enfoncé latéralement..... 3.  
Mesonotum également convexe partout, sans dépressions latérales..... 4.
3. Noir; face, pleures en partie, hanches et pattes rousses, tête un peu transversale vue d'en haut..... **H. niger** Kieff.  
Roux; abdomen noir sauf le pétiole, tête un peu allongée vue d'en haut..... **H. rufus** Kieff.
4. Yeux deux fois aussi larges que leur distance du bord occipital..... **H. brevicornis** Kieff.  
Yeux à peine plus larges que leur distance du bord occipital..... **H. gracilis** Kieff.
5. Bouche perpendiculaire au grand axe de la tête et atteignant la demi-hauteur de la tête, 2<sup>e</sup> article antennaire du mâle obconique, au moins aussi long que le 4<sup>e</sup>..... **H. longirostrum** sp. nov.  
Bouche ayant au maximum le quart ou le tiers de la hauteur de la tête, 2<sup>e</sup> article antennaire du mâle subglobuleux, n'atteignant que la demi-longueur du 4<sup>e</sup>..... 6.
6. Bouche continuant la direction du grand axe de la tête, scape avec une dent au milieu du côté externe, tête et thorax roux (♂).  
..... **H. dentatus** sp. nov.  
Bouche perpendiculaire au grand axe de la tête, scape inerme, tête et thorax noirs (♂), ou tête noire, thorax roux (♀)..... **H. auriculatus** sp. nov.

**Hemigalesus auriculatus** sp. nov. (♂, ♀.)

Tête noire, thorax et abdomen d'un brun noir chez le mâle, roux marron chez la femelle, pétiole de la femelle et pattes d'un roux jaune, antennes d'un brun sombre chez le mâle, d'un roux jaune chez la femelle. Tête subglobuleuse, spinule médiane petite, les 2 latérales en forme de lamelle un peu transversale, subarrondie. Palpes jaunes, pluriarticulés. Scape droit, bispinuleux à l'extrémité, sans dent au milieu du côté externe, 2<sup>e</sup> article très court et subglobuleux chez le mâle, moins gros et de moitié plus petit que le 4<sup>e</sup>, le 3<sup>e</sup> plus long que le 4<sup>e</sup>, 4-13 cylindriques, presque de moitié plus longs que gros, 14<sup>e</sup> de moitié plus long que le 13<sup>e</sup> et aussi gros que lui, flagellum pubescent et mat, 3<sup>e</sup> article de la femelle obconique, 3-9 également minces, 4-9 d'abord globuleux, puis un peu transversaux, 10-12 subitement très grossis, 10<sup>e</sup> et 11<sup>e</sup> aussi longs que gros, cylindriques, 12<sup>e</sup> ovoïdal. Bouche en forme de bec, presque perpendiculaire au grand axe de la tête,

égalant le tiers ou le quart de la hauteur de la tête. Ocelles situés en avant, à la limite de la surface horizontale du vertex et du front qui est presque vertical. Tête vue de côté aussi longue que haute. Thorax d'un tiers plus long que haut. Partie postérieure des tempes et partie antérieure du prothorax avec un feutrage blanc. Mesonotum transversal, convexe au milieu, déprimé latéralement, de moitié plus long que le scutellum. Celui-ci triangulaire, aussi large que long, avec une fossette en avant. Segment médian avec une arête. Ailes subhyalines, dépassant beaucoup l'abdomen, ciliées longuement, sous-costale très rapprochée du bord, dépassant un peu le tiers proximal de l'aile, marginale obcunéiforme, basale d'un jaune pâle, double de sa distance de la marginale, perpendiculaire mais n'atteignant pas la sous-costale. Tibia postérieur subitement renflé au tiers distal. Pétiole non strié, aussi long que gros; abdomen déprimé, chez le mâle graduellement élargi jusqu'à l'extrémité du 2<sup>e</sup> tergite, qui occupe les  $\frac{2}{3}$  antérieurs de l'abdomen; chez la femelle l'abdomen est elliptique et le grand tergite atteint presque l'extrémité.

Taille: 2.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

*Hemigalesus dentatus* sp. nov. (♂.)

Tête, thorax et pétiole d'un roux marron, abdomen brun noir, deux premiers articles antennaires d'un roux brun, pattes d'un jaune roux. Tête vue de côté un peu plus longue que haute, plus longue ventralement que dorsalement, bec continuant la direction du grand axe de la tête. Scape avec une petite dent au milieu du côté externe. Thorax de moitié plus long que haut. Pour tout le reste, semblable au précédent.

Taille: 2.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

*Hemigalesus longirostrum* sp. nov. (♂.)

Noir; antennes d'un roux brun comme la bouche, hanches et pattes d'un roux clair. Bec perpendiculaire au grand axe de la tête, long, atteignant la demi-hauteur de la tête. Scape graduellement grossi depuis sa base, sans dent au côté externe, son extrémité est deux fois aussi grosse que le 2<sup>e</sup> article, bispinuleuse; 2<sup>e</sup> article obconique, au moins aussi long que le 4<sup>e</sup>, 3<sup>e</sup> distinctement plus long que le 4<sup>e</sup>, 4-13 cylindriques, à peine plus longs que gros, 14<sup>e</sup> plus mince que le 13<sup>e</sup> et pas plus long que lui. Tarse postérieur comprimé, ce qui est aussi le cas pour les deux espèces précédentes. Pétiole un peu transversal, lisse et brillant;

tergites 3-6 égaux et très courts, abdomen de la longueur du thorax.

Taille: 2.5 mm. Pour tout le reste, semblable à *H. auriculatus*.

Localité: LUZON, Laguna, Mont Maquiling.

### Genus **GALESUS** Curtis

Les espèces de ce genre qui ont été observées aux Philippines se distinguent de la façon suivante:

1. Ailes entières, non incisées ni pliées..... 2.  
Ailes incisées à l'extrémité ou en arrière de l'extrémité..... 4.
2. Pattes postérieures rousses, sauf les hanches..... 3.  
Pattes postérieures en grande partie noires..... *G. manilæ* Ashm.
3. Pétiole densément pubescent de blanc, articles du flagellum du mâle deux fois aussi longs que gros..... *G. luzonicus* Ashm.  
Pétiole glabre dorsalement, articles du flagellum du mâle à peine plus longs que gros..... *G. philippinensis* Kieff.
4. Sillons parapsidaux se touchant en arrière..... *G. clavaticornis* Kieff.  
Sillons parapsidaux distants en arrière..... 5.
5. Sillons parapsidaux distants en arrière d'un peu plus de leur largeur, pétiole du mâle deux fois aussi long que gros..... *G. crawfordi* Kieff.  
Sillons parapsidaux distants en arrière de deux fois leur largeur, pétiole de moitié plus long que gros..... 6.
6. Surface dorsale de la tête plus courte que la hauteur de la tête, sillon atteignant presque le milieu de l'abdomen..... *G. curticeps* Kieff.  
Surface dorsale de la tête plus longue que la hauteur, sillon du 2<sup>e</sup> tergite prolongé par une ligne atteignant le dernier tiers.... *G. lineatus* sp. nov.

### *Galesus* (*Schizogalesus*) *lineatus* sp. nov. (♀.)

Noir, brillant, pattes sauf les hanches d'un roux clair. Tête allongée, sa surface dorsale plus longue que sa hauteur, plus courte que sa surface ventrale, lisse et brillante. Dents latérales du devant de la tête assez grandes. Yeux marginés en haut par une arête. Face très convexe, séparée de l'œil par un profond sillon, de chaque côté. Scape deux fois aussi long que gros, ridé en long, bispinuleux à l'extrémité, 2<sup>e</sup> article à peine plus long que le 3<sup>e</sup>, tous deux cylindriques, un peu plus longs que gros, 4<sup>e</sup> et 5<sup>e</sup> aussi longs que gros, 2-5 également gros, 6<sup>e</sup> à peine plus gros que le 5<sup>e</sup>, mais un peu moins que le 7<sup>e</sup>, presque transversal, 7-11 transversaux, 12<sup>e</sup> ovoïdal, pas de massue distincte ou massue de 6 ou 7 articles; flagellum pubescent. Collier du prothorax et feutrage des tempes d'un gris sombre. Sillons parapsidaux profonds, divergents en avant, distants de deux fois leur largeur au bord postérieur. Fossettes du scutellum séparées par une arête, un peu allongées, mais moins longues que les fossettes latérales, les 2 fossettes postérieures ponctiformes. Ailes un peu brunies, pliées, échancrées en arrière de la pointe alaire. Tibia

postérieur graduellement et faiblement grossi dans sa moitié distale, métatarse postérieur pas deux fois aussi long que le 2<sup>e</sup> article. Pétiole de moitié plus long que gros, cannelé grossièrement, 2<sup>e</sup> tergite occupant presque tout le dessus de l'abdomen, sillon traversant le tiers antérieur du grand tergite, prolongé ensuite par une fine ligne jusqu'à l'extrémité du 2<sup>e</sup> tiers; à sa base se voit de chaque côté une petite fossette; le 2<sup>e</sup> tergite couvre encore de chaque côté un quart de la largeur des sternites 2-5 et une partie du 6<sup>e</sup>, dorsalement il couvre les tergites 3-5.

Taille: 3.5 mm.

Localité: LUZON, Laguna, Los Baños.

Genus **STYLOPRIA** novum

Diffère de *Phænopria* surtout par les yeux poilus et le scape, dont la moitié proximale est filiforme et la moitié distale subitement grossie très fortement. Le type est:

*Stylopria rufa* sp. nov. (♀.)

Roux clair; antennes à massue d'un brun noir, abdomen noir, tiers postérieur brun roux sombre. Tête globuleuse, lisse et brillante comme tout le corps, large comme le thorax. Yeux glabres, circulaires. Bouche non proéminente. Palpes très courts, non proéminents. Bord postérieur des tempes avec une pubescence soyeuse. Scape à moitié distale subitement grossie, trois fois aussi grosse que la moitié basale qui est filiforme, 2<sup>e</sup> article obconique, deux fois aussi gros que le 3<sup>e</sup>, 3-9 également minces, obconiques, sauf le 9<sup>e</sup> qui est subglobuleux, 10-12 formant une massue subite et grosse, 10<sup>e</sup> subglobuleux, 11<sup>e</sup> transversal et plus gros que le 10<sup>e</sup>, 12<sup>e</sup> brièvement ovoïdal. Thorax un peu plus long que haut. Prothorax avec un collier de feutrage blanc, interrompu en haut. Mesonotum transversal, convexe, sans sillons parapsidaux. Scutellum convexe, sans fossette à sa base. Segment médian avec une faible carène. Ailes dépassant beaucoup l'abdomen, longuement ciliées, hyalines, sous-costale formant le bord, dépassant un peu le tiers basal, marginale obcunéiforme, de son extrémité élargie part une trace de la basale dirigée obliquement vers la base alaire et fortement courbée en angle au milieu, une trace semblable ou ligne jaunâtre indique une médiane éloignée du bord, arquée, graduellement rapprochée du bord à son extrémité qui aboutit à la base de la marginale. Aile inférieure linéaire, sauf que son bord antérieur est relevé triangulairement à l'endroit des crochets fréniaux, cils inférieurs deux fois aussi longs que la largeur de l'aile. Tibia postérieur subitement grossi au tiers distal. Pétiole aussi

long que gros, pubescent de gris; abdomen à peine déprimé, fusiforme, aussi long que le reste du corps, 2<sup>e</sup> tergite occupant les deux tiers antérieurs, 5<sup>e</sup> tergite égalant le 3<sup>e</sup> et le 4<sup>e</sup> réunis, extrémité de l'abdomen en pointe.

Taille: 1.2 mm.

Localité: LUZON, Laguna, Los Baños.

### Genus *ASHMEADOPRIA* Kieffer

Quatre espèces de ce genre reviennent aux Philippines; elles se distinguent comme il suit:

1. Yeux poilus ..... *A. (?) trichota* sp. nov.  
Yeux glabres..... 2.
2. Scutellum caréné ..... 3.  
Scutellum convexe, non caréné..... 4.
3. Pétiole pas plus long que gros, verticilles antennaires atteignant l'extrémité de l'article suivant (♂)..... *A. bakeri* Kieff.  
Pétiole de moitié plus long que gros (♀)..... *A. subcarinata* sp. nov.  
Pétiole deux fois aussi long que gros, verticilles antennaires atteignant la massue du 2<sup>e</sup> article suivant (♂)..... *A. luzonica* sp. nov.
4. Scutellum à fossette unique, tête et thorax noirs..... *A. nigriventris* Kieff.  
Scutellum à 2 fossettes ponctiformes et très distantes, tête et thorax noirs..... *A. bipunctata* Kieff.

#### *Ashmeadopria luzonica* sp. nov. (♂.)

Noir, brillant; antennes, hanches et pattes rousses, moitié basale du scape et massue des articles 4-13 un peu obscurcies. Yeux glabres. Antennes de moitié plus longues que le corps, 3<sup>e</sup> article cylindrique, aussi long que le 4<sup>e</sup>, à 2 verticilles de poils, 4-13 avec une massue deux fois aussi longue que grosse, pétiole au moins aussi long que la massue, mais graduellement raccourci et massue graduellement allongée, au 14<sup>e</sup> article le pétiole est très court, verticilles longs, atteignant la massue du 2<sup>e</sup> article suivant. Prothorax à collier de feutrage blanc. Mesonotum convexe partout. Scutellum caréné, avec une fossette unique. Segment médian avec une lamelle triangulaire. Ailes hyalines, longuement ciliées, dépassant de beaucoup l'abdomen, marginale comme d'ordinaire, n'atteignant pas l'extrémité du tiers basal, de son extrémité distale part une trace de la basale jaune brisée en angle au milieu. Pétiole deux fois aussi long que gros, lisse, brillant, sauf sur les côtés qui ont des poils soyeux blancs, longs, denses et dressés; abdomen en ellipse allongée, déprimé, grand tergite atteignant presque l'extrémité.

Taille: 2 mm.

Localité: LUZON, Laguna, Mont Maquiling.

**Ashmeadopria bipunctata** Kieff.

Localité: LUZON, Laguna, Mont Maquiling.

Cet insecte n'était connu que de Los Baños; la femelle reste encore à découvrir.

**Ashmeadopria subcarinata** sp. nov. (♀.)

Noir; antennes rousses, sauf la massue, hanches et pattes jaunes. Tête globuleuse. Scape cylindrique, 2<sup>e</sup> article égal au 3<sup>e</sup>, obconique, 4-7 également minces, pas plus longs que gros, rétrécis basalement, 8-12 formant une massue graduelle, aussi longs que gros, sauf le 12<sup>e</sup> qui est ovoïdal et plus long, pubescence très fine et très courte. Tempes, devant du prothorax et métapleures avec un feutrage blanc. Scutellum à peine caréné, fossette unique. Ailes dépassant beaucoup l'abdomen, ciliées longuement, nervation ordinaire de ce genre. Tiers distal du tibia postérieur subitement grossi. Pétiole de moitié plus long que gros, sa moitié postérieure porte dorsalement un feutrage blanc, dense et long; abdomen un peu plus long que le thorax, déprimé, en ellipse, 2<sup>e</sup> tergite occupant plus des deux tiers antérieurs, extrémité un peu en pointe.

Taille: 1.8 mm.

Localité: LUZON, Laguna, Mont Maquiling.

**Ashmeadopria (?) trichota** sp. nov. (♀.)

Se distingue de tous ses congénères par les yeux à poils longs et épars. Roux; antennes et pattes d'un roux plus pâle, deux derniers articles antennaires noirs, abdomen brun au milieu. Tête globuleuse. Tempes, devant du prothorax et métapleures, avec un feutrage blanc et dense. Scape subcylindrique, arqué, aussi long que les 3 articles suivants réunis, 2<sup>e</sup> article de moitié plus long que le 3<sup>e</sup> et plus gros que lui, tous deux obconiques, 4<sup>e</sup> obconique, un peu plus court que le 3<sup>e</sup>, un peu plus long que gros, 5-9 à peine plus longs que gros, 3-9 également minces, à poils égalant leur grosseur, 10<sup>e</sup> bien plus gros que le 9<sup>e</sup> mais bien moins gros que le 11<sup>e</sup>, ovoïdal, 11<sup>e</sup> et 12<sup>e</sup> très gros, finement pubescents, le 12<sup>e</sup> ovoïdal court, le 11<sup>e</sup> à peine transversal. Mesonotum convexe, transversal, sans sillons. Scutellum caréné, avec une fossette en avant. Ailes hyalines, dépassant l'abdomen, longuement ciliées, nervation ordinaire. Tibia postérieur subitement renflé au tiers distal. Pétiole subglabre dorsalement, de moitié plus long que gros; abdomen déprimé, aussi long que le thorax, en ellipse allongée, 2<sup>e</sup> tergite occupant les deux tiers antérieurs, tiers postérieur graduellement aminci.

Taille: 2 mm.

Localité: LUZON, Laguna, Los Baños.

Genus **TRICHOPRIA** Ashmead

Les espèces de ce genre qui ont été observées aux Philippines se distinguent comme il suit:

1. Thorax roux..... 2.  
Thorax noir comme la tête et l'abdomen..... 3.
2. Tête et quart postérieur de l'abdomen roux..... *T. analis* Kieff.  
Tête et abdomen noirs, sauf le pétiole..... *T. semirufa* Kieff.
3. Scutellum avec deux fossettes..... *T. maquilingensis* sp. nov.  
Scutellum avec une fossette unique..... *T. caudata* Kieff.

**Trichopria maquilingensis** sp. nov. (♂.)

Noir, brillant; 2 premiers articles antennaires roux, hanches et pattes jaunes. Tête globuleuse. Scape cylindrique, un peu plus court que les articles 2 et 3 réunis, 2<sup>e</sup> obconique, égal au 5<sup>e</sup>, 3<sup>e</sup> cylindrique, un peu plus long que le 4<sup>e</sup>, presque deux fois aussi long que le 5<sup>e</sup>, 4<sup>e</sup> arqué fortement, grossi à l'extrémité, plus long que le 5<sup>e</sup>, 5-13 un peu plus longs que gros, sub-cylindriques, à poils épars, égalant en longueur les  $\frac{2}{3}$  de la grosseur des articles, 14<sup>e</sup> article un peu plus long que le 13<sup>e</sup>. Scutellum convexe, avec 2 fossettes distantes de leur largeur. Ailes hyalines, dépassant beaucoup l'abdomen, ciliées longuement, pubescentes sauf aux alentours de la sous-costale, marginale comme d'ordinaire, de son extrémité sort une ligne jaune et perpendiculaire. Tibia postérieur subitement grossi au tiers distale. Pétiole pubescent, de moitié plus long que gros; abdomen déprimé, elliptique.

Taille: 1.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.

Genus **SCAPOPRIA** Kieffer**Scapopria atriceps** Kieff.

Cet insecte, dont le mâle est encore à découvrir, n'était connu que pour Los Baños. M. Baker vient aussi de le découvrir au Mont Maquiling, très près à Los Baños.

**BELYTIDÆ**Genus **XENOTOMA** Foerster

Une espèce était connue pour Los Baños; nous y ajoutons une seconde.

1. Pattes blanchâtres, abdomen droit..... *X. philippinensis* Kieff.  
Pattes d'un roux brun, abdomen recourbé au bout..... *X. soror* sp. nov.

**Xenotoma soror** sp. nov. (♀.)

Noir; mandibules rousses et se croisant, antennes d'un brun noir, scape noir, pattes d'un roux brun. Antennes filiformes,

scape plus long que le 3<sup>e</sup> article, 2<sup>e</sup> article globuleux, 3<sup>e</sup> quatre fois aussi long que gros, 3-14 graduellement raccourcis, le 14<sup>e</sup> un peu plus long que gros, plus court que le 15<sup>e</sup>. Cellule radiale fermée, très mince, deux fois et demie aussi longue que large, beaucoup plus courte que la postmarginale, stigmatique oblique et très courte, récurrente plus longue que la marginale, continuant la direction du radius, puis dirigée par en bas, marginale un peu plus courte que la cellule radiale. Pétiole presque deux fois aussi long que gros, strié; abdomen aussi mince à la base que le pétiole, piriforme, grand tergite occupant les  $\frac{2}{3}$ , le dernier  $\frac{1}{3}$  forme une pointe conique recourbée par en haut.

Taille: 2 mm.

Localité: LUZON, Laguna, Los Baños.

Genus **CINETUS** Jurine

*Cinetus maquilingensis* sp. nov. (♂.)

Noir; mandibules rousses, antennes d'un brun noir, pattes antérieures d'un jaune clair, sauf les trochanters et les hanches, les quatre pattes postérieures brunes sauf les hanches. Antennes filiformes, 2<sup>e</sup> article subglobuleux, 3<sup>e</sup> plus long que le 1<sup>er</sup> et le 2<sup>e</sup> réunis, fortement découpé au tiers distal, renflé à l'extrémité, un peu plus long que le 4<sup>e</sup>, les suivants graduellement raccourcis, les derniers encore trois fois aussi longs que gros. Ailes hyalines, marginale plus longue que la cellule radiale qui est étroite, fermée et à peine plus longue que la moitié de la postmarginale, stigmatique très courte, récurrente presque double de la cellule radiale, dirigée par en bas dès son origine, parallèle à la basale. Pétiole fortement strié, deux fois et demie à trois fois aussi long que gros, égalant au moins la moitié de l'abdomen qui est déprimé, brièvement fusiforme, strié à sa base, où il passe insensiblement au pétiole, sans séparation bien distincte.

Taille: 2.5 mm.

Localité: LUZON, Laguna, Mont Maquiling.





## NOTES ON A NESTING PLACE OF CROCODILUS PALUSTRIS LESSON

By W. SCHULTZE

(From the Entomological Section, Biological Laboratory, Bureau of Science,  
Manila, P. I.)

One plate

During the biological expedition of the Bureau of Science and the University of the Philippines to Taytay, Palawan, April 7 to June 7, 1913, opportunity was taken to explore two lakes near Taytay, the larger one being called by the natives from the village of Bantolan "Manguao," the smaller one "Nagsirocan." According to the statements of old natives, neither had been visited before by white men. Lake Manguao is located approximately 8 kilometers south of the town of Taytay. Mr. E. D. Merrill and several natives relocated an old direct trail from Taytay to Lake Manguao during the latter part of April, 1913. A second trip to the lake was made on May 11, by a party consisting of A. L. Day, R. A. Rowley, Mrs. Schultze, myself, and several assistants and guides, and we camped there until May 16. Our camp was located on the southwestern shore. On May 14, while going close to the shore on a raft, Mr. Day<sup>1</sup> discovered a peculiar heap or mound of grass on the beach in one of the little bays of the lake. Upon coming back to camp, our guides, natives of the town of Bantolan, were asked as to the nature of the peculiar mound. They stated that it might be the nest of a crocodile. Whereupon the next morning Mr. Rowley, his assistant, Mrs. Schultze, and I went on a bamboo raft to investigate the place. The mound was made of a very coarse, wiry, thick-stemmed grass (*Ischaemum* sp.) which had been torn out by the roots, scratched together, and piled up. A space about 8 meters long and 5 meters wide, on the sandy beach, had been cleared absolutely of the grass. The mound

<sup>1</sup> He states:

Lake Manguao is indicated on various charts, but because of the fact that very little surveying has been done in northern Palawan the lake has heretofore been incorrectly located. On May 14, I went on a bamboo raft southeast from our camp. On the southeast side of the second point I observed a mound of grass, the nature of which was not clear.

was located about 2 meters from the water. It was somewhat irregular in shape, about 2.5 meters in diameter at the base and 1.5 meters in height. All around the mound, foot marks of a crocodile and furrows made by the animal's claws could be seen, so it was evident that the reptile had completed the nest very recently, that is, within the preceding few days, as several heavy rains would have washed away the marks in the sand. In pulling the mound apart, it was noticed that the material was very firmly packed. The grass was mixed with sand and was moist. In about the center of the mound and about 40 centimeters above the ground, 30 eggs were found arranged in several layers. The eggs were taken with part of the nest material to our camp. One egg was opened, and it appeared to be absolutely fresh. On the next day, the eggs were transported in a tin can by carriers over a bad mountain trail to our main camp at Taytay. I there packed the eggs in a box filled with fresh grass, leaves, and some of the original nest-material. On June 7 the eggs were taken to Manila, where I kept them with the object of determining the period of incubation and time of hatching. Measurements of 20 eggs gave the following results.

*Measurements, in millimeters, of 20 eggs of Crocodilus palustris Lesson.*

78 × 50	77 × 49.5	77 × 49.5	83.5 × 46
75.5 × 49.5	76 × 49.5	76 × 49	78 × 50
76 × 49.5	76 × 49.5	73.5 × 49	79 × 49
76 × 49.5	76 × 49	80 × 49	79 × 48
75.5 × 49.5	75.5 × 49.5	83.5 × 50	82 × 48.5

Average 77.65 × 49.15.

The egg is decidedly oblong ellipsoidal and has a very hard porous shell with a high porcelain luster. Though the color is a translucent white, the egg has very strongly marked opaque white band around the middle (girth). The band is about 4 centimeters wide and in strong contrast with the two ends of the egg.

The eggs were kept in the box with the original material and covered with a 5-centimeter layer of old horse manure. As the incubation proceeded, the white band on the egg became less distinct. On July 1, one egg was opened; the embryo was about 6.5 centimeters long. On August 19, another egg was opened, and the embryo was found to be 19 centimeters long. On September 4, as no egg had hatched, I opened all of those which showed signs of incubation and found that all of the embryos had died except in one egg which was about ready to hatch. Their death was probably due to the fact that the material in

which they were packed had shrunken to such an extent that most of the eggs were not covered by more than 2 centimeters of the packing and that they therefore became too dry. At any rate, the time of incubation of the eggs of *Crocodilus palustris* is from seventeen to eighteen weeks in the Philippines.

During our stay at Taytay, we frequently noticed crocodiles close to the shore in the sea. The species was probably *Crocodilus porosus* Schneid., the widely distributed seashore species. On an expedition to Malampaya Sound, west of Palawan, on August 20, 1913, I saw a specimen of this species at very close range, and the natives informed me that these reptiles are very abundant at the farther end of the sound. This statement was verified by members of our party, who saw as many as twenty at one time. Their abundance there is probably due to the large number of fish found in the sound. A specimen of *C. porosus* Schneid., from Zamboanga, Mindanao, which I have had under observation for three years, measured 30 centimeters when received, and at the present time measures 85 centimeters, which indicates that crocodiles grow faster than is ordinarily supposed, at least during the early years of their life.



## ILLUSTRATION

### PLATE I

FIG. 1. A nest of *Crocodilus palustris* Lesson. (Photograph by R. A. Rowley.)

2. An egg of *Crocodilus palustris* Lesson. Actual size. (Photograph by Charles Martin.)

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Fig. 1. A nest of *Crocodilus palustris* Lesson.

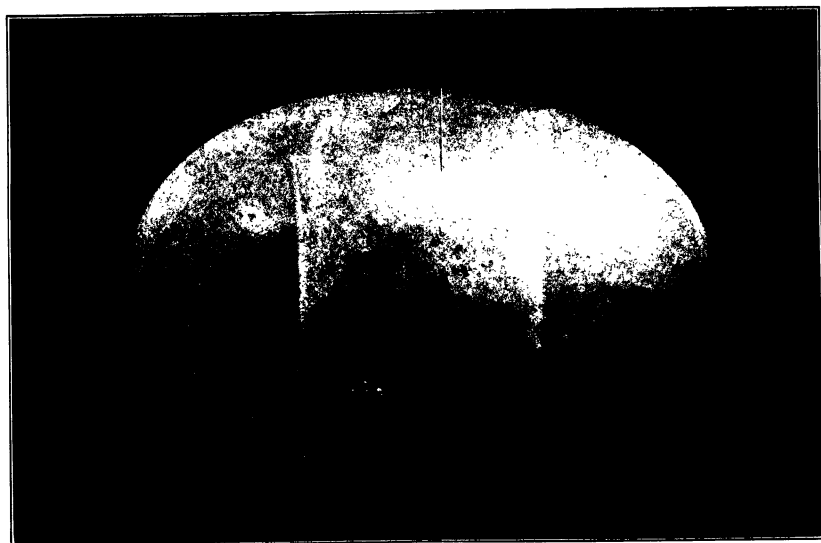


Fig. 2. An egg of *Crocodilus palustris* Lesson. Actual size.





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## PALAEMONS OF THE PHILIPPINE ISLANDS

By R. P. COWLES

(From the Department of Zoölogy, College of Liberal Arts,  
University of the Philippines)

Three plates and 1 text figure

The palaemons are widely distributed over the world, but are usually confined to the fresh-water lakes and rivers of tropical and subtropical countries. A few species, however, inhabit the temperate regions and some live in the sea and in brackish water. In the Philippine Islands this genus is well represented, and especially is this the case in the lakes and rivers near Manila where several species are very abundant. The palaemons, commonly but incorrectly spoken of as "shrimps" or "lobsters," appear occasionally in our markets, and are considered an excellent food, being even more highly esteemed than the so-called "salt water shrimps" belonging to the genus *Penaeus*. They form an important article of food for the Filipinos who live inland; consequently, most of them are purchased before they reach the markets of such coast cities as Manila.

A glance at a map of the Philippines shows how rich the Islands are in rivers and streams which flow to the sea. It is safe to say that all of them contain palaemons and that these are used by the Filipinos for food. I have collected these crustaceans from streams near Port Galera on Mindoro Island, from streams at Taytay on Palawan Island, from a small river at Sisiman on Luzon Island, and from Mariquina, San Juan, and Pasig Rivers near Manila. In addition to specimens from the

above-mentioned localities, we have in our collection specimens from Gandara, Samar Island; from Lake Lanao, Mindanao Island; from Jaro, Leyte Island; and from Pampanga River, Luzon Island.

While the palaemon fishery in the Philippines is not so large as some other fisheries, it is an industry which is carried on all over the Islands and is one which deserves to be improved if possible. The French people are famous for the way in which they have cultivated the fresh-water crayfish in France, and even here near Manila it is said that an attempt has been made to grow palaemons in some of the fishponds. A series of experiments conducted on a scientific and practical basis would be of great value to this industry.

#### METHODS USED IN FISHING

At least seven methods of fishing for palaemons are employed in the Philippine Islands. (1) The larger forms are often caught in a large fish trap known as the *baclad*. This consists of a split bamboo fence arranged in the form of a V. The palaemons follow the two wings of the V until they reach a narrow opening at the angle, through which they pass into an inclosure. The narrow opening is guarded by pieces of bamboo which point inward and prevent the crustaceans from escaping. (2) The smaller forms are frequently caught by men and boys who dive and feel about in holes and crevices for them. (3) Another trap which is used is the *bobo*, a rectangular box made of bamboo. The bobo is filled with hay or grass through an opening in one side, and is then lowered to the bottom. It is allowed to remain in the water for two or three weeks until the hay or grass has decayed, after which the palaemons enter to feed on the material and the trap is hauled up. (4) The familiar cast net is also used in shallow water where the palaemons can be seen. It has been given the name *dala* by the Filipinos. (5) Another familiar way of catching these crustaceans is by hauling an ordinary seine. This seine, which is provided with a pocket, is called *pukot*. (6) A method frequently employed is the following: Two men are seated in a banca, the one in the bow handles a dip net and the other in the stern does the paddling. The frame to which the net is attached is triangular, and is firmly attached at one angle to a long handle. This net is held close to the bottom where it catches the palaemons as the banca moves forward. (7) The *talabog* consists of a large bundle of roots bound together at both ends. This is lowered into the water and the palaemons instinctively cling to it or hide among the roots.

When the talabog is brought to the surface, they still remain attached. On Mindoro there is a modification of this method. Instead of the roots, a large bundle of leaves baited inside with cooked rice is used.

#### VALUE OF THE FISHERY

The commercial value of the palaemon fishery is difficult to estimate. Many Filipinos living along the banks of the rivers and lakes catch only enough for their own use. Fishermen who make a business of catching palaemons usually retail their catch in the locality where they live; and in the neighborhood of towns or cities, as an example, Manila, the catches are not taken to the markets unless they are large.

The price varies a little with the abundance of the catch. Very small individuals, those from 1 to 2 centimeters long, are sold by measure, while those from 10 to 15 centimeters long bring about 2 or 3 centavos<sup>1</sup> each. Palaemons larger than these are sold for 20, 30, or 40 centavos, while the largest with a body length of from 30 to 35 centimeters bring from 40 to 50 centavos each. I have been told that larger specimens than any in our collection are caught occasionally and that these may bring as much as 80 centavos.

The palaemon fishery is at its height during the hot and rainy seasons, and it is then that the bulk of the year's catch is made. Unfortunately, it is at this time that the breeding occurs in most of the species. One of the most successful fishermen living on the banks of San Juan River at the town of San Juan del Monte states that he and another fisherman, together with three helpers, catch from 20,000 to 25,000 palaemons in a season and that these net from about 540 to 550 pesos. There are a few other fishermen farther up the river whose business is not so large, but it is safe to say that the total value of the palaemon fishery in this one river easily reaches 2,000 pesos in one season.

In Pasig River and, especially, where it and its branches have their origin from Laguna de Bay, the palaemon fishery is of much more importance than that in San Juan River. A trip from the barrio of Tagig along one of the smaller branches of Pasig River to Laguna de Bay will convince one of this. One bank of this stream is lined by fishermen's houses, each with its small baclad for catching the kind of palaemon that is sold by measure, and where the stream widens out as it issues from Laguna de Bay one may see several hundred of the large baclads

<sup>1</sup> One centavo equals 0.5 cent United States currency; 100 centavos equal 1 peso or 50 cents United States currency.

planted in the shallow water. It is in these large baclads that during the months of April, May, June, July, and August, especially, a local form of *Palaemon carcinus* Fabricius of India is caught in great numbers. The fishery in this region must amount to from 20,000 to 25,000 pesos per year.

#### EXTERNAL CHARACTERS OF A PALAEMON

As it is the purpose of this paper to describe the various species of Philippine palaemons so that people in the Philippine Islands who are not zoologists may be able to identify specimens, I shall devote a little space to a simple description of the external anatomy of a palaemon (fig. 1).

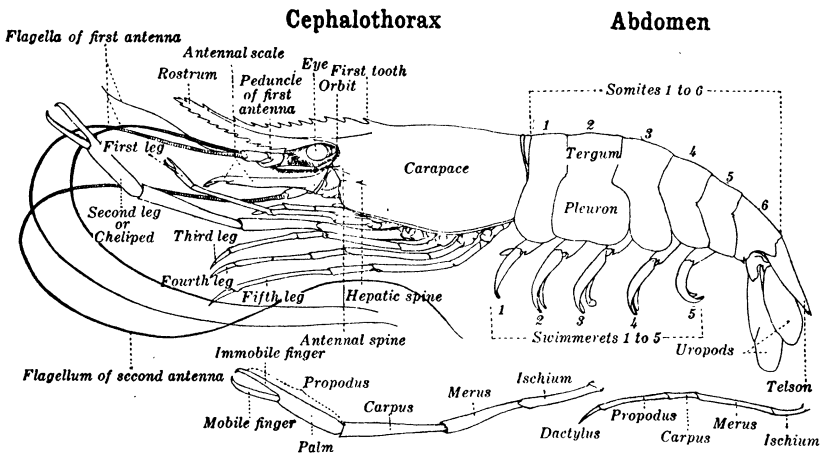


FIG. 1. Diagram of a palaemon.

The body of the palaemon may be divided into a forward or anterior part known as the cephalothorax and a hind or posterior jointed part known as the abdomen. The cephalothorax is composed of a head and a thorax which are so closely joined together that there is no neck, and it is covered above—dorsally—and on the side—laterally—by a tough shield-shaped carapace. From the front of the carapace a pointed beak or rostrum extends forward, and is armed with teeth along its dorsal and its lower—ventral—border. The “first tooth” in the following description means the most posterior tooth arising from the carapace and the number of teeth on the dorsal and ventral borders of the rostrum is indicated in the form of a fraction which I have called the rostral or dental formula  $\left( \frac{10, 11, 12, 13}{3, 4} \right)$ . There are 2 spines on each side of the carapace near the

anterior border. The upper one is called the antennal spine; the lower one, the hepatic spine. On each side of the rostrum where it has its origin from the carapace is an eye mounted on a stalk. The stalk occupies a little niche in the carapace known as the orbit. Extending forward from the base of the eye stalk along each side of the lower border of the rostrum is a peculiar structure known as the peduncle of the first antenna. Each one bears a pair of whiplike flagella. The outer flagellum of the pair has a short branch arising near its origin from the peduncle. Below the peduncle of the first antenna on each side of the rostrum lies a large scalelike structure known as the antennal scale. From the underside of each scale where it has its origin from the cephalothorax arises the long whiplike flagellum of the second antenna. On the lower side of the cephalothorax are attached 5 pairs of leglike structures, which are known as the first, second, third, fourth, and fifth pairs of legs. The chelipeds (second pair of legs) are much larger than the others, and terminate in pincers. The first legs, which are much shorter and slenderer than the chelipeds, have their origin from the cephalothorax in front of the origin of the chelipeds, and are usually folded once under the body. They also terminate in small pincers. The third, fourth, and fifth legs are slenderer and shorter than the chelipeds, but stouter than the first legs. They do not end in pincers. Each leg consists of jointed pieces or segments. The segments of the cheliped are as follows: The pincers are made up of 2 fingers, which are armed with teeth. One of these is movable, and is known as the mobile finger; the other is known as the immobile finger, and is continuous with a thick piece known as the palm. The immobile finger and the palm are often spoken of as the propodus. The propodus, including the mobile finger, is called the chela. The segment next to the chela is the wrist or carpus, which is joined to another segment known as the merus. Finally, the last piece or ischium follows the merus and is attached to the cephalothorax by 2 very short pieces, the names of which it is not necessary for us to consider. The first leg is made up of the same number of segments as the cheliped, and these have the same names.

The back or posterior portion of the body, which is often bent under, is known as the abdomen, and is composed of 7 pieces, the first 6 of which are known as somites. The seventh or terminal piece, which is pointed, is called the telson. Each somite has a tough covering, the dorsal surface and part of the lateral surface of which are known as the tergum. The lower part of the lateral surface is called the pleuron. Each

of the first 5 somites has a pair of branched structures attached to its lower surface, which are known as swimmerets, and the sixth somite has a somewhat similar but larger pair called the uropods. The uropods and the telson together make up the tail fin.

While zoölogists might have no difficulty in identifying palaemons among a number of other crustaceans more or less related, one who is not specializing in this line might have considerable trouble. For this reason, I shall compare several forms found in the waters about Manila which might be mistaken for them. One of the commonest crustaceans, which may be seen almost any day in our markets, is the "salt water shrimp" belonging to the genus *Penaeus*. This can be distinguished from the palaemon by the more or less evident keellike ridge on the dorsal surface of the posterior part of the abdomen, by the absence of large legs, and by the presence of pincers on the first, second, and third legs.

The pistol crab, belonging to the genus *Alpheus*, is occasionally seen in the markets, and differs from the palaemons in the following particulars: The rostrum is very small or absent, the first legs are strong and provided with pincers, the second legs are weak and have small pincers, and the third, fourth, and fifth legs are weak and without pincers.

Another form which is used for food by Filipinos, although not highly thought of, belongs to the genus *Atya*, and is found in mountain streams. It may be distinguished easily from the palaemons by the peculiar pincers of the first and second legs. These pincers are provided with brushes of hairs which are used to catch mud and minute organisms. The third, fourth, and fifth legs have no pincers.

Finally, I shall mention the large brilliantly colored "sea crawfish" or "spiny lobster" (*langosta del mar*) belonging to the genus *Palinurus*. It lives along rocky shores washed by the open sea, and is occasionally seen in our markets. All five legs are without pincers, and the antennæ are very long and spiny.

#### PHILIPPINE SPECIES OF THE GENUS PALAEMON

*Palaemon carcinus* Fabricius. Plate I, figs. 1 and 1a-j.

The largest palaemon in our collection, and undoubtedly the largest one in the Philippine Islands, I have diagnosed as *Palaemon carcinus* Fabricius. This conclusion was arrived at after a careful study of a large series, although a comparison

of this series with individuals of the Indian species shows certain distinct and constant differences. The local form differs slightly from typical *P. carcinus* in the shape of the rostrum, the rostral formula, the arrangement of the teeth on the rostrum at all ages, and the position of the tip of the rostrum with reference to the tip of the antennal scale at different ages; there is, however, a close similarity in the shape, armature, and proportions of the segments of the chelipeds. The characters of the chelipeds, just mentioned are of great diagnostic value in determining species of the genus *Palaemon*, and for this reason I have not described it as a new variety. It should be mentioned, however, that our local form of *Palaemon carcinus* probably closely resembles a form originally known as *Palaemon rosenbergii* de Man,<sup>2</sup> but which is now considered by de Man,<sup>3</sup> Ortmann,<sup>4</sup> and others as a variety of *P. carcinus*. The original description of *P. rosenbergii* was based upon a single full-grown female, and as no male has been seen I shall not place our local form under de Man's variety. However, his description agrees closely with a female specimen of about the same size which is in our collection. The shape, size, and toothings of the rostrum, as well as the measurements of the chelipeds, are almost identical.

The detailed description of the Philippine form of *P. carcinus* which follows is considered advisable, because our form differs from the type, because our collection affords a large number of different ages and sexes, and because it is the most important species from a commercial point of view in the Philippine Islands.

*Rostrum and antennal scale.*—An examination of 21 female specimens, varying in body length<sup>5</sup> from 115 to 250 millimeters, shows with one exception that the rostrum extends beyond the antennal scale. This exception (230 millimeters long) has a rostrum which appears to be normal, but the tip just reaches the distal end of the scale. In the largest specimen (250 millimeters), however, the tip extends slightly beyond, while in a young female (115 millimeters) the rostrum extends one-fourth of its length beyond the end of the antennal scale. Thirty-six

<sup>2</sup> *Notes Leyden Mus.* (1879), 1, 167.

<sup>3</sup> *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien* (1892), 2, 417.

<sup>4</sup> *Zool. Jahrb., Systematik* (1891), 5, 701.

<sup>5</sup> By body length, or length, is meant the distance from the tip of the rostrum to the tip of the telson.



TABLE I.—*Palaemon carcinus Fabricius*.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Length (posterior face of eye to posterior end of telson).	Position of peduncle of first antennæ with reference to rostral teeth.	Extension of first pair of legs beyond antennal scale.	Extension of chelipeds beyond antennal scale.
1	♂	mm. 100.0	70.5	Extends to third tooth of ventral border.	Propodus beyond	One-fourth of carpus beyond.
2	♂	125.0	89.0	Between third and fourth tooth.	One-half of propodus.	One-half of carpus.
3	♂	133.5	99.5	Fourth tooth	do	One-third of carpus.
4	♂	138.0	100.5	Between third and fourth	Almost whole of propodus beyond	Do.
5	♂	b 138.0	106.0	Fourth	Propodus and 3 mm. of carpus	One-half of carpus.
6	♂	146.0	110.0	do	Propodus	Do.
7	♂	152.0	110.0	Third and fourth	Propodus and 1 mm. of carpus	More than one-half of carpus.
8	♂	164.0	125.5	Fourth	do	One-half of carpus.
9	♂	185.5	139.0	Fourth and fifth.	do	Do.
10	♂	a 186.5	149.0	Fifth	Propodus	More than one-half of carpus.
11	♂	192.5	152.0	Fifth and sixth.	Propodus and about 2 mm. of carpus.	More than three-fourths of carpus.
12	♂	204.0	163.5	do	Propodus and one-fourth of carpus	Almost whole of carpus.
13	♂	240.0	187.0	do	do	Three-fourths of carpus.
14	b ♂	240.0	196.0	Seventh and eighth	Propodus and one-half of carpus.	Two-thirds of merus.
15	b ♂	280.0	232.0	Almost to last tooth on ventral border	do	One-half of merus.
16	b ♂	320.0	263.0	To penultimate tooth on ventral border	Propodus and one-fifth of carpus	Do.
17	♀	115.0	80.0	Third and fourth	Propodus	One-fifth of carpus.
18	♀	116.0	83.0	Fourth	do	One-third of carpus.
19	♀	154.0	115.0	do	do	One-half of carpus.
20	♀	158.0	119.0	Fourth and fifth.	do	Do.
21	♀	c 164.0	26.0	Missing	Propodus and 1 mm. of carpus	Do.
22	♀	d 172.0	128.0	Fourth	Propodus	Do.
23	♀	e 179.0	131.0	Third and fourth	Two-thirds of propodus	Two-fifths of carpus.
24	♀	e 194.0	147.0	Fourth and fifth.	Propodus and 2 mm. of carpus	Three-fifths of carpus.

No.	Sex.	Length of—							Felt on mobile finger.	Gape of fingers.	Teeth on fingers.
		Pro- podus.	Finger.	Palm.	Carpus.	Merus.	Ischium.				
25	♀	d214.0	164.5	do	do	do	do	Propodus and 5 mm. of carpus	Four-fifths of carpus.		
26	♀	c230.0	179.0	Sixth and seventh	Propodus			Propodus	Do.		
27	♀	d248.0	188.0	Fourth and fifth.	Propodus and 7 mm. of carpus			Propodus and 7 mm. of carpus	Almost whole of carpus.		
Chelipeds.											
1	♂	15.0	6.0	8.0	13.0	10.5	9.4	Absent	None	Absent.	
2	♂	24.5	12.0	12.5	18.5	15.0	13.5	do	do	Beginning to form.	
3	♂	26.0	13.0	13.0	19.0	15.0	14.0	do	do	Increasing in size.	
4	♂	27.0	13.5	13.5	19.0	16.0	15.0	do	do	Do.	
5	♂	30.0	15.0	15.0	21.5	18.0	16.5	Small amount on proximal half.	do	Do.	
6	♂	30.0	15.0	15.0	22.5	18.0	16.5	Increasing	do	Do.	
7	♂	34.0	17.0	17.0	23.0	20.0	18.0	do	Present	Do.	
8	♂	42.0	20.0	22.0	25.0	21.0	19.5	do	Increasing	Do.	
9	♂	46.0	21.5	24.5	26.0	23.5	20.5	do	do	Do.	
10	♂	51.0	24.0	27.0	28.5	26.0	22.0	do	do	Do.	
11	♂	68.0	32.0	36.0	38.0	33.0	27.5	Four-fifths covered	do	Becoming conspicuous.	
12	♂	76.0	36.0	40.0	42.5	36.5	29.5	do	do	Increasing in size.	
13	♂	79.0	36.0	43.0	47.0	38.0	34.0	do	do	Do.	
14	b ♂	159.0	67.0	92.0	111.0	87.0	44.0	Very thick	Conspicuous	Do.	
15	b ♂	177.0	71.0	106.0	111.0	95.0	47.0	do	do	Do.	
16	b ♂	207.0	85.0	122.0	122.0	100.0	57.0	do	do	Do.	
17	♀	17.0	8.5	8.5	13.5	12.0	12.0	Absent	No gaping	Visible with lens.	
18	♀	16.5	7.5	9.0	16.5	12.0	12.0	Small amount on proximal half.	do	Do.	

a Tip broken.

b Chelipeds enormously developed.

c With eggs.

d Eggs shed.

<sup>d</sup> Eggs shed.<sup>c</sup> With eggs.<sup>b</sup> Chelipeds enormously developed.<sup>a</sup> Tip broken.

TABLE I.—*Palaemon carcinus Fabricius*—Continued.

No.	Sex.	Chelipeds.							
		Length of—					Felt on mobile finger.	Gape of fingers.	Teeth on fingers.
		Pro- podus.	Finger.	Palm.	Carpus.	Merus.	Ischium.		
19	♀	mm. 29.0	mm. 12.5	mm. 16.5	mm. 22.0	mm. 18.5	mm. 18.0	Two-thirds	Visible with lens.
20	♀	28.0	13.0	15.0	26.0	18.5	20.5	Four-fifths	Increasing in size.
21	♀	34.5	16.0	18.5	27.0	22.0	19.0	Two-thirds	Do.
22	♀	30.0	14.0	16.0	26.5	20.0	20.0	do	Do.
23	♀	30.5	14.0	16.5	26.5	20.5	20.0	do	Do.
24	♀	39.5	18.0	21.5	33.5	25.0	25.0	do	Do.
25	♀	56.0	26.0	30.0	44.5	32.0	31.0	Gape increasing	Do.
26	♀	69.0	32.0	37.0	46.0	35.5	33.0	do	Do.
27	♀	78.5	33.0	45.5	47.0	39.0	36.0	do	Do.

male individuals (short chelipeds),<sup>6</sup> varying in body length from 100 to 240 millimeters, show that the rostrum overreaches the antennal scale. In specimens from 100 to 110 millimeters long the rostrum extends almost one-third of its length beyond the antennal scale, and this distance gradually decreases until in individuals 240 millimeters long it overreaches the antennal scale only slightly. Finally, in 4 large males (chelipeds enormously developed) measuring from 250 to 320 millimeters, the rostrum fails to reach the tip of the scale. In fact, in another male only 240 millimeters long but with the chelipeds enormously developed the condition is similar. While this gradual decrease in the length of the rostrum might be explained by the assumption that during the life of these palaemons the tip is repeatedly broken off and then partially regenerated, it is hard to believe that such is the case, considering the uniform character of the decrease shown by the series at hand.

The descriptions or figures of *Palaemon carcinus* by Fabricius,<sup>7</sup> Herbst,<sup>8</sup> M. Milne-Edwards,<sup>9</sup> Ortmann,<sup>10</sup> de Man,<sup>11</sup> and Henderson and Matthai<sup>12</sup> all indicate that the rostrum extends beyond the antennal scale, while Henderson's<sup>13</sup> description and Rumphius's<sup>14</sup> figure show that these authors have examined some specimens in which the rostrum extends to the tip of the antennal scale only or fails to reach it. Von Martens<sup>15</sup> mentions the fact that the rostrum of *Palaemon carcinus* from Luzon is strikingly short. Henderson finds great variation in the length of the rostrum of *P. carcinus* from India, some specimens showing the rostrum scarcely longer than the scale. This fact and others leave him in considerable doubt as to the limitations of

<sup>6</sup> In our collection, except in one case, male specimens of *P. carcinus*, from the shortest to those 240 millimeters long, have the short weakly developed chelipeds like those of the female, but in males 250 millimeters long, or longer, the chelipeds are enormously developed.

<sup>7</sup> Fabricii Entomologia Systematica Supplementum (1798), 5, 402.

<sup>8</sup> Versuch einer Naturgeschichte der Krabben und Krebse (1796), 2, Tab. XXVIII, Fig. 1.

<sup>9</sup> Histoire Naturelle des Crustacés (1837), 2, 395.

<sup>10</sup> Zool. Jahrb. Systematik (1891), 5, 701.

<sup>11</sup> Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien (1892), 2, 414.

<sup>12</sup> Records Indian Mus. (1910), 5, Pl. XV, fig. 1a. Henderson and Matthai, in the general part of their paper on palaemons, state that the rostrum in the young is relatively longer than in the adults and that it is usually relatively longer in females than in males.

<sup>13</sup> Trans. Linn. Soc. London, Zool. (1893), 5, 411.

<sup>14</sup> D'Ambonische Rariteitkamer (1741), Pl. I, fig. B.

<sup>15</sup> Arch. f. Naturgesch. (1868), 5, 35.

the species, and he is forced to regard such species as belonging to a variety in which the apical growth of the rostrum has been arrested. It does not seem to me probable that the gradual decrease in length between the tip of the antennal scale and the tip of the rostrum, which is so strikingly illustrated in our series, is unique for the form we have here in the Philippines. On the contrary, I believe that an examination of a large series of *P. carcinus* from India will show a similar condition, and I am inclined to agree with that part of Henderson's statement in which he says that the apical growth of the rostrum may be arrested. From a study of specimens of *Palaemon carcinus* and *Palaemon philippinensis* sp. nov., I believe that the growth of the rostrum becomes partially arrested when the so-called mature characters are acquired and that this change is especially marked in the males.

*Curvature and dental formula of rostrum.*—Females of all ages show the distal one-third of the rostrum curved upward, but this is more evident in the young than the old. The arching over the eye, which is pronounced in *Palaemon carcinus* from India, is not conspicuous in the Philippine form, and remains about the same throughout the life of the female. The upward curve of the distal part of the rostrum in the males does not seem to differ from that in the females, except in the large males (those with the enormously developed chelipeds), where the tip scarcely bends upward at all. The degree of arching over the eye is slightly greater in the old than in the young males.

The dental formula is very variable. An examination of the specimens in the collection shows the formula for the males (100 to 320 millimeters) to be  $\frac{11, 12, 13, 14}{8, 9, 10, 11}$ . In one exceptional case 12 teeth are found on the lower border, 2 of which, however, are situated well up under the arch over the eye. The smallest male (100 millimeters) has the formula  $\frac{12}{8}$ , while the largest male (320 millimeters) has  $\frac{11}{9}$ . In the females (115 to 250 millimeters) the formula is  $\frac{11, 12, 13}{8, 9, 10}$ . Those of the smallest (115 millimeters) and largest (about 250 millimeters) are  $\frac{12}{10}$  and  $\frac{12}{9}$ , respectively. It appears that the number of teeth in the males is somewhat greater than in the females, but there

is no evidence that the number of the teeth increases with the age. In the large majority of both males and females the formula is  $\frac{12 \text{ to } 13}{9 \text{ to } 10}$ . The dorsal border of the rostrum in young males and females may be divided into a proximal two-thirds armed with 9 or 10 teeth and a distal one-third usually unarmed, except near the tip where there may be 2 or 3 teeth. (A similar condition has been described by von Martens<sup>16</sup> for *Palaemon carcinus* from Luzon.) The bases of the first and second teeth and part of the base of the third tooth lie back of the orbit. These teeth are more widely separated from one another than the following 6 or 7 teeth, and also the ninth and tenth teeth are separated somewhat more from the teeth directly back of them. The unarmed portion of the distal one-third has a length of 9 or 10 millimeters in specimens measuring 115 millimeters in body length, and beyond this lie the 2 or 3 rather widely separated teeth of the tip region. The usual 9 or 10 teeth of the ventral border are more widely separated toward the tip than at the proximal end. In middle-aged males and females the arrangement of the teeth is similar, but the unarmed space is, relatively, slightly shorter. The bases of the first, second, and third teeth of the upper border in the largest males lie back of the orbit, and the unarmed space is proportionately shorter than in the middle-aged males and females.

The following facts concerning the rostrum of *Palaemon carcinus* found in the Philippines seem clear from the study of our collection:

1. The rostrum increases in length as the body length becomes greater.
2. In young males and females the rostrum extends much beyond the antennal scale.
3. As the males and females grow older, the rostrum extends less beyond the antennal scale; this is, especially, the case in males.
4. In old males (250 to 320 millimeters), those with the enormously developed chelipeds, the rostrum fails to reach the antennal scale by a considerable distance.
5. The number of the teeth does not vary with the length of the rostrum, with the length of the body, nor with the age of the individual.

*Relative position of first antenna and rostrum.*—As in other palaemons, the peduncle of the first antenna fails to reach the antennal scale. While it increases in length as the animal grows older, it retains about the same relative proportions; that is, the peduncle extends forward over about three-fifths of the

<sup>16</sup> *Ibid.* (1868), 5, 35.

antennal scale of the second antenna. A glance at Table I shows that the tip of the peduncle varies in position with reference to the teeth on the lower border of the rostrum. In the smallest males and females it extends to the third or fourth tooth, while in the largest males with the small legs and in the largest females it extends to the fifth, sixth, or seventh tooth. In the large males with the enormously developed chelipeds the tip of the peduncle reaches almost to the end of the rostrum.

*First pair of legs.*—The length of the first pair of legs with reference to the length of the antennal scale does not seem to vary much. In young males and females usually the propodus of the first leg extends beyond the tip of the antennal scale, while in the largest males the propodus and as much as one-fourth or one-half of the carpus may be seen beyond the tip of the scale.

*Chelipeds.*—The chelipeds are much shorter in young males and females than the length of the body from the tip of the rostrum to the tip of the telson. Even in the adult and largest females these fail to equal the body length. Also, males under 240 millimeters in length with weakly developed legs have the chelipeds shorter than the body, but males over 250 millimeters in length have the chelipeds longer than the body. The chelipeds of the largest male in our collection (body length, 320 millimeters) measure 486 millimeters (ischium, merus, carpus, and propodus), and they extend with one-half of the merus beyond the tip of the antennal scale. As a rule, in young males and females the palm and fingers are nearly of the same length, but as the animals grow older the palm increases in length more rapidly than the fingers, so that the proportion may be as much as 1 : 1.43. In Table I it will be seen that the smallest male in the collection shows a proportion of 1 : 1.33. Only one cheliped is present in this case, and I believe the proportion is unusual. A similar proportional increase in the length of the palm is seen in the female, but it is not so striking. In all of our specimens, male and female, the carpus is shorter than the propodus. The difference is not so great in the young specimens, and I think it probable that younger specimens than we have might show the carpus to be longer than the propodus, a condition which de Man has observed in the young of the Indian form.

The fingers of young specimens (100 millimeters) show no toothing, but at 115 to 120 millimeters the teeth begin to make their appearance. The mobile finger is armed along its cutting edge with 2 acute teeth. The distal tooth is situated at a point one-third of the distance or a little more from the articulation

to the tip of the finger, and it is flattened laterally.<sup>17</sup> It measures 2.5 by 2 millimeters at the base in our largest specimens, and is 2.5 millimeters high. The proximal tooth is found about midway between the distal tooth and the articulation of the finger. It is flattened laterally, and in the largest males is smaller than, but of the same shape as, the distal tooth. In old males with the enormously developed chelipeds there are 4 teeth present on the immobile finger. The distal one, which is conical in shape (3 millimeters at the base and 3 millimeters in height), is the largest, and is situated 4 or 5 millimeters anterior to the proximal tooth of the mobile finger. Also, in younger males and females this tooth is found in front of the proximal tooth of the mobile finger but much closer to it. The next tooth, which is much smaller and less acute than any so far described, touches the proximal tooth of the mobile finger on its posterior side when the fingers are closed. Directly back of this tooth and almost continuous with it is the third tooth, which is still smaller. The fourth tooth is continuous with the third, and might be considered as a smaller cusp of the third tooth. In young males and females and even sometimes in the very old males the fourth tooth is not distinguishable, but is represented by a short raised piece of the cutting edge. In the oldest male in our collection (320 millimeters) there is an indication of a fifth or sixth tooth, which might become more distinct in larger specimens. While the toothing in general is much like that of *Palaemon carcinus* F. of India as described and figured by Henderson and Matthai,<sup>18</sup> the teeth in our form seem to be somewhat more robust. A felt-like coat of hair is present on the mobile finger of both males and females, except when they are very young. Specimens in our collection from 100 to 115 millimeters long show no signs of this hair. As a rule, only the proximal one-half of the finger is coated in the young measuring from 115 to 140 millimeters, but as the animals grow older the coat extends gradually until it covers all but the distal one-fourth. Herbst's<sup>19</sup> figure of *Pa-*

<sup>17</sup> In most living palaemons the chelipeds are held so that the immobile finger lies more nearly in a dorsal position and the mobile finger more nearly in a ventral position, but sometimes in preserved specimens the cheliped becomes twisted so that the fingers lie in a horizontal plane. In this paper the immobile finger will be considered as dorsal in position with reference to the mobile finger, and in the case of *P. carcinus* the long rows of large spines will mark the dorsal and ventral surfaces of the merus and carpus. The ischium remains in about the same position after preservation.

<sup>18</sup> *Rec. Indian Mus.* (1910), 5, 281, Pl. XV, fig. 1a.

<sup>19</sup> Versuch einer Naturgeschichte der Krabben und Krebse (1796), 2, Tab. XXVIII, fig. 1.



*laemon carcinus* shows a condition similar to that found in our form, except that the coating of hair extends a little farther toward the tip. In the figure shown by Henderson and Matthai, however, the pubescence extends to the tip of the finger. The tips of both fingers curve inward in specimens of all ages, and overlap when the fingers are closed. In young specimens with a body length of about 150 millimeters or less, the fingers when closed lie close together throughout their extent, but larger individuals have the fingers gaping. In old males the immobile finger, which is curved less sharply at the tip than the mobile finger, extends beyond the latter. The immobile finger of the largest male presents 13 or 14 indistinct longitudinal rows of small spines. Several of these rows, especially the one along the cutting edge, are made up of larger spines than those of the other rows. Near the tip of the finger the cutting edge disappears and the number of rows of spines is reduced. Spines are absent along the cutting edge and the region covered by the felt of the mobile finger, but a few spines are to be seen along the incurved tip. The cutting edge disappears near the tip. In young males and females the fingers are spineless.

The palm of the largest male in our collection measures 122 millimeters in length. It is flattened laterally at the distal one-half, measuring 13 by 16 millimeters, but at the proximal one-half it becomes almost cylindrical in cross section, measuring about 15 millimeters in diameter. It presents about 18 longitudinal rows of spines, which in general are larger than those on the fingers, and the rows on the inner surface are made up of spines which are larger than those of the rows on the outer surface. An average-sized spine of the larger kind measures 2 millimeters in length. The palm is marked on each lateral surface by a longitudinal groove, and each of these grooves is continued, except with a break at the joint, into a "linear space" on the outer and inner surfaces, respectively, of the carpus which is similar to that described by Hoffman, von Martens, and Coutière. The shape of the palm in all younger males and females is the same as that of the old males. Males and females of middle age show the characteristic rows of spines, but these are not so conspicuous, and in young males and females they are only visible with a lens. The grooves can be seen in specimens of all ages and both sexes represented in our collection.

The carpus in our largest male equals the palm in length, but probably in larger specimens it is shorter. In the oldest females the palm is shorter than the carpus, and the same is true of young individuals of both sexes. Table I shows that the

palm grows faster than the carpus as the individuals increase in size, a fact which has been pointed out by several authors. The carpus of the largest male in the collection measures 122 millimeters in length, and is cylindrical in cross section throughout practically the whole extent. Near its distal end the diameter is 17 millimeters, while at a point near the proximal end it measures 13 millimeters. Eleven indistinct longitudinal rows of small spines are present on the outer surface, and these are separated from 3 indistinct rows of medium-sized spines on the inner surface by a dorsal and a ventral longitudinal row of blunt and conspicuous spines. One of the largest of these spines is 4 millimeters in length. The 2 linear spaces mentioned above are very distinct, and lie on the dorsolateral and ventrolateral regions of the outer surface. All younger males and females show the carpus to be of the same shape as that of the large male. In the youngest individuals (100 to 115 millimeters) minute spinules may be seen with a lens, and slightly older specimens show the beginnings of the 2 rows of largest spines. The "linear spaces" can hardly be made out until the spines show clearly to the naked eye.

The merus, which retains about the same relative proportion in length to the carpus throughout life, is cylindrical anteriorly in the largest male, and has a length of 100 millimeters. It increases gradually in size, passing from the proximal end forward, and near the distal end suddenly decreases in diameter thus giving the impression of a swelling. About 13 millimeters from its proximal end it measures 13 millimeters, and at the thickest part of the distal end it measures 18 millimeters in diameter. The merus at its articulation with the ischium is much flattened dorsoventrally, so as to correspond to the distal end of the ischium. The dorsal and ventral longitudinal rows of large spines, which are very conspicuous on the carpus, are even more so on the merus, one of the largest spines measuring 5 millimeters in height. There are 6 indistinct longitudinal rows of small spines on the outer surface and 5 indistinct rows of medium-sized spines on the inner surface. The more dorsal "linear space" of the carpus is continued on the merus, while the more ventral one is absent or at least not clearly marked. The description of the character of the surface of the carpus in younger males and females applies to that of the merus in specimens of the same age.

The ischium (57 millimeters in length) in the largest male is greatly flattened dorsoventrally, and increases in size toward the distal end. On the dorsal and ventral surfaces there are 2 lon-

gitudinal grooves, one of which is deep. These divide the surface into 3 regions—2 lateral and 1 median. Distally the median region of the dorsal surface is highly convex and armed with several stout spines, while the rest of this surface is spineless. The median region of the ventral surface is smooth. The externolateral region of the ventral surface presents a longitudinal row of fairly stout spines and 2 rows of smaller spines; the internolateral region of the same surface is armed with 2 longitudinal rows of fairly stout spines; the externolateral region of the dorsal surface presents 2 rows of medium-sized spines; and the internolateral region presents 1 row of fairly stout spines. In younger males and females the more shallow groove mentioned above is absent, so that the same regions cannot be distinguished. The armature and shape remain about the same, except that the spines diminish in size until in the smallest specimens no spines are visible. The ischium grows slower (Table I) than the merus and carpus, a fact which has been noted in the publications of other authors on palaemons in general.

*Third, fourth, and fifth legs.*—The third pair of legs in specimen 2 is absent. The tip of the fourth leg and the dactylus of the fifth leg extend beyond the tip of the antennal scale. The diameter of the propodus of the fifth leg in the middle is 0.75 millimeter, and the length is 15 millimeters. In specimen 9 the tips of the dactyli of the third, fourth, and fifth legs extend slightly beyond the tip of the antennal scale, and the measurements for the propodus of the fifth leg are 1.25 by 25 millimeters. The fifth leg only of specimen 16 is present, and 7 millimeters of its propodus extend beyond the scale. It measures 4 millimeters in diameter at its middle, and is 61 millimeters long.

*Telson.*—The telson of the local form agrees with the descriptions and figures which have been published for *Palaemon carcinus*. The innermost pair of lateroterminal spines on each side of the tip is the largest and best developed. The tip of the telson is acute, and does not extend as far as the posterior border of the uropods.

*Character of surface.*—As in many other palaemons, the character of the surface of the carapace and abdomen differs with the age. The carapace and abdomen of males and females from 100 to 190 millimeters in length are strikingly smooth to the touch and under magnification show no spines. The third, fourth, and fifth pairs of legs are beset with rows of minute yellowish spinules, especially along their distal two-thirds, but the first pair of legs are devoid of spines of any sort. Males and

females, 190 to 240 millimeters long, show a similar condition to that found in the smaller individuals, except that the merus and ischium of the first pair of legs are armed with spinules and the spinules of the third, fourth, and fifth legs are larger. The surface of the carapace in large males (240 or 250 to 320 millimeters, with long chelipeds) is rough to the touch and beset with spinules, except along the extreme posterior border. The spinules of the dorsal and anterolateral regions are larger than those of other parts. These spinules, which are usually acute, point forward, and average about 0.5 millimeter in length. Most of the dorsal and lateral surfaces of the abdominal segments and the dorsal surface of the inner ramus of each uropod have a growth of fine spinules, causing them to feel rough to the touch. The first, third, fourth, and fifth legs are armed like younger specimens, but the spines are larger.

*Eggs.*—The eggs of the local form of *Palaemon carcinus* measure from 0.5 by 0.5 to 0.5 by 0.66 millimeter.

*Color of living specimens.*—The local form of *Palaemon carcinus* varies in color with the age, but the color is fairly constant for any one age. The following color notes are taken from living specimens. The carapace of females (115 to 190 millimeters) is greenish gray, but is marked with brown, gray, or cream-colored streaks running longitudinally. The terga and pleura of the abdomen have a general color similar to that of the carapace, and are marked with rather irregular but more or less parallel streaks of brown, gray, or cream, which make a somewhat definite pattern. In the region of the hinge of each of the abdominal somites is an orange-colored patch; these patches are especially evident on the fourth, fifth, and sixth somites. The ventral and lateral edges of the first 3 abdominal somites show a cream-colored band, while the ventral edges of the fourth and fifth somites have a similar but narrower band. A cream-colored band is also present along the edges of the rami and the outer edge of the basipodite of the swimmerets. The chelipeds are blue or lavender in color, but where the segments join there is an orange-colored patch. The first and second antennæ are blue, in part at least, and the internal flagellum of the first antenna is a conspicuous blue. The rostrum is strikingly marked by the vermilion color of its lateral longitudinal ridge. The colors practically all disappear, sooner or later, when the specimens are preserved, leaving the animals yellow in color. Living males (100 to 190 millimeters) have a color which is similar to that of the young females, except that the cream-colored band is absent on the pleura of the abdomen.

A faint cream-colored band is present on the external rami of the swimmerets. As the males and females (190 to 240 or 250 millimeters) grow larger and the chelipeds become longer, the general color becomes a darker blue and the brown, gray, or cream-colored lines on the carapace and abdominal somites and the cream-colored bands on the pleura become much less distinct. The color of other parts still persists, but becomes somewhat darker. In old males (240 or 250 to 320 millimeters) with the enormously long chelipeds the color is much less brilliant than in the younger specimens. The dorsal region of the carapace and abdomen is brownish green, and the lateral regions are light green or brown. The brown, gray, or cream-colored markings and bands so characteristic of smaller individuals disappear almost entirely, while the orange-colored spots on the abdomen and at the articulations of the segments of the chelipeds, the vermilion color of the ridge on the rostrum, and the conspicuous blue of the first and second antennæ usually persist to some extent, but become noticeably darker. The chelipeds appear at first sight a dirty black, but on closer examination they are seen to be a very dark, dirty blue, except in the proximal region where they are greenish blue. The third, fourth, and fifth legs are bluish green in color. The ventral border of the pleura of the sixth abdominal segment shows a distinct orange-colored band.

A comparison of the color of the local *Palaemon carcinus* with descriptions and color drawings of *Palaemon carcinus* from India shows, that while there is a general similarity there are some striking differences. The blue color of the cephalothorax and abdomen is absent, and in its place there are cream-colored bands and other markings. The latter may be present in young specimens of the Indian form. The first and second antennæ, so far as I have been able to make out from colored drawings and descriptions, are not blue like those of our local form, and it is of interest to note that in no other palaemon in the Philippines with which I am familiar are the antennæ colored in the same way as those of the local form of *P. carcinus*. Finally, the striking changes in color as we pass from the younger specimens to the older ones, if occurring in *Palaemon carcinus* of India, do not seem to have been recorded.

*Old and young males.*—While specialists on the genus *Palaemon* are familiar with the fact that the old males in some species look very different from the young males and while it seems probable that the same is true for all species of *Palaemon*, it is difficult to convince one who is not a zoölogist or even a zoölogist

who is not familiar with palaemons that the old males are of the same species as the young males and females. The following are my reasons for considering the large brownish palaemon, which is seen in our museums and sometimes in our markets and which has the extremely long and thick chelipeds, as the same species (*P. carcinus*) as the beautifully colored young males and females with short weak chelipeds:

1. Both the first and second antennæ show the deep peacock blue color, which is found in no other species in our collection.
2. If we assume that the large brown form with the enormous chelipeds is a different species from the smaller brightly colored males and females, then we have to account for the facts that all of the large brown forms are males, that no females have been found corresponding to them in size and shape, and that the fishermen have never caught any females like them.
3. The number of teeth on the dorsal and ventral borders of the rostrum is approximately the same in both.
4. While the rostrum is distinctly shorter proportionately in the large brown form, a gradual reduction in the relative length of the rostrum can be traced if we place both kinds together in a series arranged according to increasing body length.
5. In living specimens a series shows how the brilliant color of the young gradually grades into the dull brown of the old form.
6. Both kinds have the coat of felted hair on the mobile finger.
7. The chelipeds are blue in both forms, but very dark blue in the large form.

"*Mâles féminisés.*"—It is not possible to determine whether or not our collection of *P. carcinus* contains what Coutière<sup>20</sup> speaks of as "*mâles féminisés*," although all the males, except the oldest ones, show the female characteristics; that is, the chelipeds are weak and short. Plate I, figs. 1e and 1f, shows how little the chelipeds of the full-grown female and the chelipeds of the young male differ from one another. As a matter of fact, our collection does not contain any young male which has taken on the characteristics of the old males, with the possible exception of the specimen (240 millimeters) noted in Table I. These males are more numerous in our collection of *Palaemon philippinensis* sp. nov., which is described on page 340.

The enormous increase in the size of the chelipeds and the change in shape of the fingers in the old males of *P. carcinus*, *P. lar*, *P. jamaicensis*, and other species are phenomena which cannot fail to stimulate the mind of the zoölogist. Ortmann<sup>21</sup> thinks that we have every reason for believing that the beautiful

<sup>20</sup> *Ann. Sci. Nat., Zool.* (1900), 11, 269.

<sup>21</sup> Bronn's *Klassen und Ordnungen des Thier-Reichs* (1901), 5, 1242.

chelipeds of the male *Palaemon carcinus* are sexual adornments. In our local form of *Palaemon carcinus* the chelipeds of young males, young females, and mature females are blue or lavender, while the chelipeds of the old males are very dark, inconspicuous blue. I can readily believe that the blue color is an adornment, but I can hardly believe that it is attractive to the females, even if we assume that they have color sense, as these palaemons live in water which is far from clear. A study of the habits of the palaemons may throw some light on the meaning of these large chelipeds.

*Localities.*—We have in our collection 41 males and 21 females which were collected from Pasig River, San Juan River (a tributary of Pasig River), and Laguna de Bay, the source of Pasig River. All of these bodies of water are in the neighborhood of Manila, Luzon. Since the above was written, several large specimens have been added to the collection by A. L. Day, who collected them in Naujan Lake near Calapan, Mindoro.

*Palaemon philippinensis* sp. nov. Plate II, figs. 2 and 2a-m.

This species presents much variation in the shape and general appearance of the rostrum. The proportion of the carpus to the merus of the chelipeds is not constant, the carpus increasing in length faster than the merus as the animal grows longer. Another characteristic of this species (possibly of all species of *Palaemon*) is the occurrence of dimorphic males; that is, some of the males of medium size have chelipeds of about the same length and shape ("mâles féminisés" of Coutière)<sup>22</sup> as those of the females of the same size, and other males of small or medium size, but usually covered with brownish sediment, have the characteristics of the largest and undoubtedly mature males; namely, enormously long chelipeds with well-armed and gaping fingers (young mature males). In our collection the "mâles féminisés" far outnumber the other males (Table II).

<sup>22</sup> *Ann. Sci. Nat., Zool.* (1900), 11, 269. In the present paper the following terms are used to distinguish between different forms of males: "Young males," "mâles féminisés," "young mature males," and "old mature males." The distinction between the different forms is not always clearly defined, but the terms are used for convenience in description and for the purpose of indicating my attitude in reference to Coutière's statement that dimorphic males exist among palaemons. It should be understood, however, that I have no proof that the "mâles féminisés" are nonbreeding individuals or that the "young mature males" are breeding individuals. The former term is used for medium-sized male specimens that have chelipeds like those of the females and the latter term is employed for such small or medium-sized males as have chelipeds like those of the largest males.

*Palaemon philippinensis* seems to be most nearly related to *P. nipponensis* de Haan,<sup>23</sup> differing from this species in size, in the absence of the rather thick coating of hairs on the fingers, and in the presence of distinct tubercles along the sides of the cutting edge. The tubercles (absent in young males, in most "mâles féminisés," and in all females but the largest specimen) remind one of *P. elegans* de Man<sup>24</sup> and *P. rudis* Heller,<sup>25</sup> but in *Palaemon philippinensis* the tubercles are found on both sides of the cutting edge of the mobile finger and only on one side, the inner, of the cutting edge of the immobile finger.

Two other striking characteristics of this species are the variability in the shape of the rostrum, reminding one of *P. weberi* de Man, and the variability in proportion between the lengths of the carpus and merus, which also seems to be characteristic of *P. ritsemae* de Man<sup>26</sup> and *P. rudis* Heller. These variations, together with the occurrence in the collection of both forms of the male, would have aroused a doubt in my mind as to the specimens being of one species if I had not seen them all shortly after they were taken from the water, when the living color was still retained and when they showed a characteristic T-shaped pigment mark and certain obliquely placed pigment marks on each side of the carapace, which are found in no other species in our collection. (See discussion on the color of *P. philippinensis*.)

The following is a description of the largest male specimen in the collection (one from San Juan River near Manila), after which follows a comparative description of specimens differing in age and sex:

This male (Table II, specimen 31) (Plate II, figs. 2, 2a, 2b, and 2c) measures 144 millimeters in length. The rostrum fails to reach the tip of the antennal scale. The dorsal border is conspicuously convex over the eye, the ventral border curves upward moderately, but the tip is not directed upward. The ridge along the side of the rostrum divides the surface of the latter into an upper wide and a lower narrow area. Along the dorsal border are 12 teeth, the first, second, and third of which are situated on the carapace. These are separated by wider intervals than those immediately following. The ninth and eleventh teeth are also farther apart than those immediately

<sup>23</sup> Fauna Japonica. Siebold (1833), 1, 171.

<sup>24</sup> Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien (1892), 2, 440.

<sup>25</sup> Reise der Österreichischen Frigate Novara (1868), 2, 115.

<sup>26</sup> Zool. Jahrb., Systematik (1897), 9, 774.



TABLE II.—*Palaemon philippinensis* sp. nov.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Carapace length (posterior face of eye to posterior border of carapace).	Rostral formula.	First antenna (position of peduncle with reference to rostral teeth).	First pair of legs (extension beyond antennal scale).	Extension of chelipeds beyond antennal scale.
1	♂	mm. 33.5	mm. 6.5	13/5	To third tooth on ventral border	Tip of propodus extends slightly beyond antennal scale.	Absent.
1a	♂	39.5	8.0	11/3	Almost to third tooth on ventral border	Tip of propodus	Two-thirds of carpus.
2	♂	90.0	22.0	11/4	To fourth tooth on ventral border	A little of carpus	Almost whole of carpus.
3	♂	92.5	23.5	11/4	About 1.5 mm. beyond fourth tooth	One-third of carpus	One-fourth of merus.
4	♂	• 103.5	27.5	10/3-11/3	About 1.5 mm. beyond third tooth	Almost one-half of carpus	Almost one-half of merus.
5	♂	104.0	27.0	12/3	1.5 mm. beyond third tooth	Little of carpus	All of carpus.
6	♂	104.5	29.5	12/4	1.5 mm. beyond fourth tooth	About one-half of carpus	Almost one-half of merus.
7	♂	108.0	29.0	12/4	do	Little of carpus	Not quite all of carpus.
8	♂	108.5	29.0	12/4	About 1.5 mm. beyond fourth tooth	About one-half of carpus	All of carpus.
9	♂	109.5	30.5	11/4	Almost to tip of rostrum	Little of carpus	Not quite all of carpus.
10	♂	110.0	29.0	13/5	Extends to fifth tooth	About one-fourth of carpus	All of carpus.
11	♂	110.5	30.0	12/5-13/5	About 1.5 mm. beyond fourth tooth	One-third of carpus	One-half of merus.
12	♂	111.0	30.0	13/4	Little beyond fourth tooth	Little of carpus	All of carpus.
13	♂	111.5	33.0	11/2	About to tip of rostrum	One-third of carpus	Little more than one-half merus.
14	♂	112.5	30.0	13/4	About 1.5 mm. beyond fourth tooth	Almost one-third of carpus	All of carpus.
15	♂	113.0	31.5	12/4	do	About one-half of carpus	Almost one-half of merus.
16	♂	113.0	30.0	12/4	1.5 mm. beyond fourth tooth	Little of carpus	Whole of carpus.
17	♂	113.0	31.0	12/4	do	One-fourth of carpus	Not quite all of carpus.
18	♂	114.0	30.0	13/5	To tip of fourth tooth	A little of carpus	All of carpus.
19	♂	114.0	30.0	12/3	About 2 mm. beyond fourth tooth	Almost one-sixth of carpus	Do.
20	♂	115.0	32.0	11/4	Almost reaches tip of rostrum	One-third of carpus	Do.
21	♂	117.0	31.0	12/4	1.5 mm. beyond fourth tooth	Little over one-fourth of carpus	Not quiet all of carpus.

22	♂	118.0	32.0	13/4	About 1.5 mm. beyond fourth tooth	Almost one-half of carpus	All of carpus.
23	♂	119.0	34.0	12/4	2 mm. beyond fourth tooth	One-third of carpus	One-half merus.
24	♂	121.5	33.0	12/4	Slightly beyond fourth tooth	One-fourth of carpus	Little of merus.
25	♂	124.0	33.5	13/4	One-half way between tip of rostrum and fourth tooth.	One-third of carpus	Whole of carpus.
26	♂	125.0	34.0	12/4	Almost to tip of rostrum	do	One-half of merus.
27	♂	125.5	36.0	13/5	Between fourth and fifth teeth	do	One-third of merus.
28	♂	129.0	35.5	13/4	(?)	One-half of carpus	About two-fifths of merus.
29	♂	137.0	38.5	12/4	Almost to tip of rostrum	do	Do.
30	♂	137.5	37.0	12/4	do	Absent	One-half of merus.
31	♂	144.0	40.5	12/3	do	One-third of carpus	Little more than one-half of merus.
32	♀	47.0	10.0	12/4	Peduncle extends slightly beyond third tooth of ventral border.	About two-thirds of propodus	Two-thirds of carpus.
33	♀	69.0	15.0	12/3	do	Whole of propodus	Three-fourths of carpus.
34	♀	71.5	18.0	12/4	Almost to fourth tooth	Propodus	Little more than one-half of carpus.
35	♀	86.0	20.0	13/4	To fourth tooth	do	Two-thirds of carpus.
36	♀	93.0	25.0	18/3	Almost to tip of rostrum	Little of carpus	Three-fourths of carpus.
37	♀	97.0	42.5	12/4	Tip of peduncle even with fourth tooth of ventral border.	One-fourth of carpus	Do.
38	♀	99.5	26.0	13/4	Peduncle extends slightly beyond fourth tooth.	A little of carpus	Almost whole of carpus.
39	♀	118.0	31.0	11/4	One-half way between tip of rostrum and fourth tooth.	One-half of carpus	All of carpus.

<sup>a</sup> Tip of rostrum broken.

<sup>b</sup> Body length and rostral formula estimated. Rostrum broken.

<sup>c</sup> Eggs recently shed.

<sup>d</sup> With eggs.

TABLE II.—*Palaemon philippinensis* sp. nov.—Continued.

No.	Sex.	Length of—						Total length beginning with ischium.	Gaping of fingers.	Tubercles on fingers.	Proportion of merus to carpus.
		Pro-podus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.				
		mm.	mm.	mm.	mm.	mm.	mm.	mm.			
1	♂	10.0	4.5	5.5	8.0	6.0	5.5	29.5	No gaping	Absent	1.33
1a	♂	24.0	11.0	13.0	19.0	12.0	11.0	66.0	do	do	1.58
2	♂	39.0	15.5	23.5	31.0	19.0	14.0	103.0	Slight gaping	Present	1.63
3	♂	58.5	22.0	36.5	45.0	25.5	16.5	145.5	do	do	1.76
4	♂	39.0	17.0	22.0	28.0	17.5	14.5	99.0	No gaping	Absent	1.60
5	♂	49.5	18.5	31.0	41.0	25.0	19.5	135.0	Slight gaping	Present	1.64
6	♂	39.0	16.5	22.5	26.5	17.0	14.5	97.0	No gaping	Few present	1.55
7	♂	37.5	15.0	22.5	29.0	19.0	15.0	100.5	do	do	1.52
8	♂	40.0	17.5	22.5	28.5	18.0	15.0	101.5	do	do	1.55
9	♂	38.0	16.0	22.0	28.0	18.0	16.0	100.0	do	do	1.55
10	♂	67.0	27.5	39.5	52.0	29.0	22.0	170.0	Wide gape	Present	1.78
11	♂	41.0	17.0	24.0	31.0	19.5	15.5	107.0	No gape	do	1.58
12	♂	84.5	32.5	52.0	62.0	33.5	21.5	201.5	Gape very wide	do	1.85
13	♂	41.5	17.5	24.0	30.5	18.5	16.0	106.5	No gape	do	1.64
14	♂	60.5	24.5	36.0	50.0	29.0	18.5	168.0	Slight gape	do	1.72
15	♂	44.5	17.5	27.0	32.5	20.0	15.0	112.0	No gape	do	1.62
16	♂	43.0	18.0	25.0	30.0	19.0	15.5	107.5	do	do	1.57
17	♂	39.0	16.0	23.0	28.0	17.0	15.0	99.0	do	do	1.64
18	♂	42.0	17.0	25.0	32.5	19.0	16.0	109.5	do	do	1.71
19	♂	41.0	15.0	26.0	33.0	19.0	16.0	109.0	do	do	1.73
20	♂	38.5	15.0	23.5	28.0	19.0	15.0	100.5	do	do	1.46
21	♂	44.0	18.0	26.0	34.5	20.0	17.0	115.0	do	do	1.72

23	♂	76.5	29.5	47.0	63.5	34.5	22.0	196.5	Cape wide	do	1.84
24	♂	50.5	20.5	30.0	36.5	22.0	16.5	125.5	Slight gape	do	1.66
25	♂	43.5	18.0	25.5	31.5	20.5	17.0	112.5	No gape	do	1.53
26	♂	82.0	27.0	55.0	67.0	38.0	24.0	211.0	Wide gape	do	1.76
27	♂	69.5	27.0	42.5	53.5	31.0	20.0	174.0	do	do	1.72
28	♂	69.5	26.0	43.5	51.0	30.0	20.5	171.0	Considerable gape	do	1.70
29	♂	69.5	25.5	44.0	50.5	31.5	20.5	172.0	do	do	1.60
30	♂	108.0	37.0	71.0	81.5	42.0	26.0	257.0	Very wide gape	do	1.94
31	♂	108.5	38.5	70.0	84.0	45.5	28.5	266.5	do	do	1.84
32	♀	11.0	5.0	6.0	9.5	6.0	5.5	32.0	No gape	Absent	1.58
33	♀	18.0	8.0	10.0	14.0	9.5	9.0	50.5	do	do	1.47
34	♀	18.0	8.0	10.0	13.5	9.0	9.0	49.5	do	do	1.50
35	♀	23.5	10.5	13.0	17.0	12.0	11.0	63.5	do	do	1.41
36	♀	29.0	13.0	16.0	21.0	14.0	13.0	77.0	do	do	1.50
37	♀	26.0	12.0	14.0	19.0	14.0	12.0	71.0	do	do	1.35
38	♀	30.5	12.5	18.0	23.0	16.0	12.5	82.0	do	do	1.43
39	♀	41.5	18.0	23.5	23.5	19.0	16.5	106.5	Very slight gape	Present	1.50

<sup>a</sup> Left cheliped only.

posterior to them. On the lower border are 3 teeth, the distal one of which lies some distance back of the tip. The peduncle of the first antenna reaches almost to the tip of the rostrum. One-third of the carpus of the fully extended first pair of legs extends beyond the antennal scale.

The left cheliped, which is a little longer than the right (not true of all specimens), measures 266.5 millimeters, being a little less than twice as long as the body. The immobile finger extends farther forward than the mobile finger, and is not curved inward so sharply. The fingers are a little more than one-half as long as the palm (1 : 1.81), and in this specimen they gape; that is, when their tips meet, there is an open space between the fingers. Of the 2 teeth situated near the proximal end of the mobile finger, the more distal one, which is subacute and flattened laterally, is 2 millimeters high and 2 millimeters wide at the base. The more proximal one is smaller, less acute, and is flattened laterally. It measures 1.5 millimeters in height and 1 millimeter at the base. The cutting edge of the mobile finger is seen with difficulty, being simply a very slightly raised ridge. On each side of it is a row of 12 plainly visible tubercles, which do not extend to the tip. There is no thick coating of hair as in *Palaemon nipponensis*. On the immobile finger, which is also without the thick coating of hair, is a large subacute tooth, which is situated a little posterior to the distal tooth of the mobile finger. It is conical in shape, measuring 2.5 millimeters in height and 2 millimeters in width at the base. Back of this tooth may be seen a series of 4 closely set teeth. The most anterior of the 4, which is the largest, is on a level with the more proximal tooth of the mobile finger. The second, third, and fourth decrease gradually in size, and the last 2 are incompletely separated. A series of 8 or 9 tubercles, similar to those on the mobile finger, is situated along the inner side of the very inconspicuous cutting edge. The palm, which is almost cylindrical in cross section, is flattened slightly laterally. It is of about the same size throughout its extent, and is shorter than the carpus. The cylindrical carpus, which reaches its greatest diameter (9 millimeters) some little distance back of the distal end, is much shorter than the chela, while the slightly curved merus, which is almost cylindrical near its distal end and decidedly flattened near its proximal end, is much shorter than the carpus, showing a ratio of 1:1.5. The much flattened ischium has its dorsal and ventral surfaces divided into 2 regions by a longitudinal groove. The lengths, in millimeters, of the parts of the cheliped

just described are as follows: Propodus, 105.5; fingers, 38.5; palm, 70; carpus, 84; merus, 45.5; ischium, 28.5.

The telson of this specimen ends in a subacute spine. The externolateral spines are slightly less than 1 millimeter in length, while the internolateral spines, which extend with a little less than one-half their length beyond the tip of the telson, measure about 1.5 millimeters in length. (See description of telson in smaller specimens.)

Patches of very obtuse spines are present on the anterior surface of the carapace. Similar spines are seen on the ventral and lateral parts of the pleura, on the dorsal surface of the sixth somite and the telson, and on exposed parts of the dorsal and ventral surfaces of the uropods. These spines are especially numerous on the last three structures named.

The ischium of the first pair of legs and the 5 distal segments of the third, fourth, and fifth pairs of legs are clothed with acute spinules. Eight or 9 indistinct longitudinal rows of blunt, small spines (much smaller than the tubercles) are seen on the mobile finger of the chelipeds, and the immobile finger bears 7 or 8 rows of similar spines. The palm is armed with 26 or 27 more distinct longitudinal rows, made up of larger and more acute spines than those of the palm, the spines of the ventral and dorsal surface being the largest. On the carpus are 17 or 18 longitudinal rows of spines, similar to those of the palm. A dorsal "linear space" is evident, and a ventral "linear space" is very conspicuous. It will be seen that these spaces are not situated on the lateral surface as in the local *P. carcinus*. The merus presents about the same number of longitudinal rows made up of spines similar to those of the carpus, and the dorsal and ventral "linear spaces" can still be seen, although the former is not very clear. There are 14 or 15 rows of acute spines on the ischium, the largest ones being situated on the dorsal, ventral, and internolateral surfaces.

*Rostrum and antennal scale.*—The 8 female specimens in our collection, when arranged according to increasing body length, show a gradual reduction in the length of rostrum relative to the length of the antennal scale. In a specimen 47 millimeters long the rostrum extends slightly beyond the tip of the antennal scale; in others, 69, 71.5, and 86 millimeters long, they are equal; in specimens 93, 97, 99.5, and 118 millimeters long the rostrum fails to reach the tip of the antennal scale by 2.5, 1, 3, and 3 millimeters, respectively. The rostrum extends 1 millimeter beyond the tip of the antennal scale in the smallest male specimen

(33.5 millimeters) ; in specimens from 90 to 96.5 millimeters long the tip of the rostrum barely reaches the tip of the antennal scale ; in those from 96.5 to about 124 millimeters long the rostrum usually fails to reach the tip of the antennal scale by from 1 to 3 millimeters ; and in specimens from 124 to 144 millimeters long this distance usually increases to from 4 to 6 millimeters. The specimen (111.5 millimeters) indicated in Table II is a male which has assumed adult male characters (young mature male), although its body is still only of medium length. It is covered with a dirty brown sediment, and its chelipeds are enormously developed relative to the body length. The rostrum fails to reach the antennal scale by 7.5 millimeters. The chelipeds, although much shorter than those of the specimen 144 millimeters long (Table II), are almost perfect miniatures, showing practically the same proportions. While the decrease in the relative length of the rostrum with reference to the antennal scale is not so regular with increasing size as in the local form of *Palaemon carcinus*, it is, nevertheless, plainly apparent.

*Curvature and dental formula of rostrum.*—Specimens of different ages show such a remarkable difference in the shape of the rostrum, that if I had not seen all of my specimens when alive I should hesitate to consider them as belonging to the same species. In this respect *P. philippinensis* reminds one of the variable form of the rostrum in *P. weberi* de Man<sup>27</sup> and *P. dispar* von Martens.<sup>28</sup> Certain characteristic markings mentioned under the section devoted to the color of the living individuals and not found in any other species in our collection were present in all. The youngest males (33.5 and 39.5 millimeters) and the youngest females (47 to 71.5 millimeters) have the dorsal border of the rostrum almost straight, only a very slight convexity over the eye being apparent. As the “mâles féminisés” (those similar in general appearance to females) and females increase in body length, the convexity becomes gradually more pronounced. In the largest males it is very striking, but in the largest females it is not so much so. The young and middle-aged males which take on the adult characters usually show a greater curvature of the dorsal border of the rostrum over the eye than do the “mâles féminisés” of the same size. Correlated with this increase in the convexity, as these males and

<sup>27</sup> Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien (1892), 2, 421.

<sup>28</sup> Arch. f. Naturgesch. (1868), 5, 41.

females become more nearly mature there is an increase in the distance between the longitudinal ridge on the side of the rostrum and the dorsal border. At the same time there is a decrease in the relative length of the rostrum, so that the rostrum of younger individuals is a rather narrow blade while that of the older individuals is a broader blade.

The dental formula for the males (33.5 to 144 millimeters) is  $\frac{11, 12, 13}{2, 3, 4, 5}$ , while that for the few females in our collection is,

with one exception,  $\frac{11, 12, 13}{3, 4}$ . As in the local form of *Palaemon*

*carcinus*, there is no evidence that the number of teeth on the rostrum increases with age. It should be mentioned that the exception referred to above is a female 93 millimeters long, in

which the rostral formula is  $\frac{18}{3}$  (Table II). This specimen has

recently carried eggs, and has a rostrum similar in shape to the largest males. The living color markings agreed exactly with those of other females of this species. The chelipeds, in shape, armature, and proportion, are much like the chelipeds of specimen 37 (97 millimeters) indicated in Table II. I have hesitated before diagnosing this individual as *P. philippinensis*, but as I can find no character which would rule out the specimen, except the large number of teeth on the dorsal border, I am forced to include it. In young and middle-aged males the teeth 9 and 10, or 10 and 11, or 11 and 12, or 12 and 13 on the dorsal border of the rostrum are more widely separated from one another than those farther back. The comparatively wide space between any two or any three of the teeth just mentioned is very evident in the young, but it decreases gradually as the animal grows larger, until in the largest males these teeth are almost evenly spaced. Similar prominent spaces are seen on the young, middle-aged, and older females. The first, second, and third teeth are usually found on the carapace in both males and females, although occasionally the third is astride of the edge of the orbit. The distance between the first and second and usually also between the second and third is greater than that between the teeth immediately succeeding. The lower border of the rostrum in both sexes and at all ages curves upward in its distal two-thirds, but this upward curving is not so pronounced in old age. The most distal tooth of the lower border is almost invariably at a considerable distance from the tip of the rostrum.



The specimens of *Palaemon philippinensis* in our collection bring out the following facts concerning the rostrum in this species:

1. The rostrum increases in length as the body grows longer.
2. Its relative length compared with the length of the antennal scale becomes less with increasing age, and only in the young does it extend beyond the tip of the scale.
3. The convexity of the dorsal border over the eye increases as the individuals grow more mature, and as a result the distance between the longitudinal ridge on the side of the rostrum and the dorsal border increases greatly.
4. The wide spacing between the teeth near the tip of the rostrum decreases with age, and almost disappears in old males.

*Relative position of first antennæ and rostrum.*—The peduncle of the first antenna retains the same relative proportions with reference to the antennal scale of the second antenna throughout life, and never extends to the tip of the scale. Generally in young and middle-aged males and females the peduncle of the first antenna extends to about the third or fourth tooth of the lower border of the rostrum, but in the largest specimens, especially the males, it reaches or almost reaches the tip of the rostrum. Small males which have taken on the mature male characteristics (young mature males) also sometimes show the tip of the peduncle even with the tip of the rostrum (Table II, No. 13). The relative position of the tip of the rostrum and the tip of the peduncle of the first antenna at different ages reminds one of the condition in the local form of *Palaemon carcinus*, although in a series of *Palaemon philippinensis* arranged according to increasing body length the approximation of the tips of the peduncle and rostrum does not take place so gradually and uniformly with increasing body length as in the former.

*First pair of legs.*—In the smallest males and females a portion of the propodus extends beyond the tip of the antennal scale, while in larger males and females a portion of the carpus is also seen extending beyond it (Table II).

*Chelipeds.*—The chelipeds of small males and females are shorter than the body, and with certain exceptions this condition persists with increasing body length, although the chelipeds of larger individuals show a relatively greater length compared with that of the body (Nos. 1a, 2, 5, 7, 8, 9, 10, 12, 14, 16, 17, 18, 19, 20, 21, 22, 25 (?), 32, 33, 34, 35, 36, 37, 38, 39). The exceptions mentioned are the large mature males (Nos. 26, 27, 28, 29, 30, 31) and the smaller males which have taken on the mature characters (Nos. 3, 4, 6, 11, 13, 15, 23, 24). By mature charac-

ters are meant the gaping of the fingers, the proportionately larger teeth on the fingers, the exceedingly long chelipeds, and the roughness of carapace, pleura, sixth abdominal somite, and telson.

All specimens of *P. philippinensis* in our collection possess fingers which are shorter than the palm, the next to the smallest male (No. 1a) showing a proportion of 1:1.22 and one of the largest males (No. 30) a proportion of 1:1.91. In general, as the body grows larger the palm increases in length at a greater rate than the fingers. A similar but much less marked proportional increase occurs in the females. The fingers of *P. philippinensis* show no signs of the long hairs or of the felted hairs which are characteristic of *P. nipponensis* and *P. carcinus*, respectively, but all specimens in the collection possess a few scattered tufts of hair, which do not obscure the underlying structures in the least. The teeth, which have been described above as present on the fingers of a large male, can be seen in the youngest males and females only with a high-power magnifying lens. They soon increase in size as the animal grows larger (90 millimeters), and become visible to the naked eye. In the small males (No. 3 and others that have taken on the mature form and which for convenience I have called young mature males) the teeth are conspicuous, their size being in proportion to the length of the cheliped. Two teeth on the mobile finger and 1 tooth (the distal) on the immobile finger are present in the youngest males and females (Nos. 1a and 32). In females and "mâles féminisés" of the size of No. 19 the small teeth back of the proximal tooth on the immobile finger are just beginning to form. The tips of the fingers curve inward at all ages and meet, except in the largest males and sometimes in the young mature males, where the immobile finger curves in much less and extends beyond the mobile finger. In small males, in "mâles féminisés," and in all the females with the possible exception of No. 39, the fingers do not gape when closed, but in young mature males and especially in the old males the gaping is conspicuous. A keellike cutting edge is found on both fingers of all males and females. This is rather high and sharp in young males (including "mâles féminisés" and young mature males of smaller size), but it decreases in height markedly with increasing body length in the young mature males and less rapidly in the "mâles féminisés" and females. In the large males Nos. 30 and 31 and the older young mature males Nos. 23 and 26, the keel is reduced to an inconspicuous raised line which can be seen only with a magnifying lens. The tubercles

mentioned in the description of the large male as being present along the outer and inner sides of the cutting edge of the mobile finger and along the inner side of the immobile finger cannot be seen in the smallest males (Nos. 1a and 2) nor in any of the females except No. 39, in which they are slightly developed. In the smallest young mature male (No. 3) they show slightly, becoming better developed in specimens of larger size (Nos. 4, 6, 11, 13, 15, 23). "Mâles féminisés," when sufficiently large (Nos. 7, 8, 9, 10, 12, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 27), show the tubercles, but in one of these, No. 17, the row on the outer border of the cutting edge of the mobile finger is represented by only 2 tubercles. In No. 18 this row is not present, but the inner row on each finger is well developed, while in Nos. 7, 8, 9, and 10 only very few tubercles along the inner border of both fingers are seen. Numbers 14, 16, 20, 21, 22, 24, and 25 show the characteristic 2 rows on the mobile and 1 row on the immobile finger.

The palm in specimens of all sizes and sexes is similar in shape to that of the larger male already described. In young specimens the fingers are a little shorter than the palm (1:1.22 in No. 1a), but as the body length increases the palm grows faster than the fingers, until in the oldest male the fingers are only a little more than half the length of the palm. It is probable that smaller specimens than those in our collection would show the fingers equal to, or even shorter than, the palm.

The carpus, which is cylindrical in cross section and a little shorter than the propodus in all our specimens, increases gradually in diameter, passing from the distal to the proximal end. The palm is always shorter than the carpus, but a comparison of lengths at different ages indicates, in general, that the palm grows a little faster than the carpus, although considerable variability is seen in a series arranged according to the body length.

The relative lengths of the merus and carpus are shown in Table II, where the specimens are arranged according to increasing body length. Here again much variability appears, but if the young mature males are separated the variability is not so marked. The proportions given in Table II show clearly that, in general, the merus of the male does not increase in length as fast as the carpus. This condition is not evident in the small number of females we have in the collection. A similar and no less striking increase in the proportion of the merus to the carpus may be seen in the specimens of *P. ritsemae* de Man examined

by Coutière,<sup>29</sup> and I believe that large series of *P. idae* Heller<sup>30</sup> and *P. rudis* Heller<sup>31</sup> will show the same thing. The merus, which is flattened dorsoventrally along the proximal part, becomes almost cylindrical in cross section and of greater diameter at the distal part. As in other palaemons, the merus grows more rapidly than the ischium. While Table II shows that there is some variability in the proportion between the merus and ischium when a series of specimens is arranged according to increasing body length, it may also be seen that when the measurements for young mature males are separated from the rest this variability is much reduced.

The description of the shape of the ischium given for the largest male applies to specimens of all ages and sexes.

The chelipeds of young specimens show spines on the palm and anterior part of the carpus, but the "linear spaces" are not distinguishable. The covering of spines increases as the animals become larger, but it is not until they have reached about the middle size that the spines become apparent on the fingers and ischium. The "linear spaces" then show clearly.

*Third, fourth, and fifth legs.*—The third legs are missing in specimen 1a. One-quarter and two-fifths of the propodus extend beyond the tip of the antennal scale in the fourth and fifth legs, respectively. The measurements for the propodus of the fifth leg are 0.16 millimeter in diameter at the middle and 7 millimeters in length. In No. 16 the third, fourth, and fifth legs extend with two-thirds, two-fifths, and one-fourth of the propodus, respectively, beyond the antennal scale. The propodus of the fifth leg is 0.7 millimeter in diameter at the middle and 17 millimeters in length. A large specimen measuring 133 millimeters (not indicated in Table II) shows one-fourth of the propodus of the third leg extending beyond the antennal scale. In this specimen the dactylus of the fourth leg extends beyond the scale, while in the fifth leg merely the tip of the dactylus overreaches the scale. The propodus of this leg is 19 millimeters in length, and 1 millimeter in diameter at its middle point.

*Telson.*—The armature of the telson varies with the size, but the difference may be due to wear. In a young female 47 millimeters long (Plate II fig. 2l) the tip of the telson is long, the externolateral spines are well developed, and the internolateral spines are very long, with almost three-fourths of their

<sup>29</sup> *Ann. Sci. Nat., Zool.* (1900), 11, 314.

<sup>30</sup> *Sitzungsber. Akad. d. Wiss., math.-nat. Klasse*, Wien (1862), 45, 416.

<sup>31</sup> *Reise der Österreichischen Fregatte Novara* (1868), 2, 115.

length reaching beyond the tip of the telson. This condition figured by Ortmann.<sup>32</sup> In older specimens (Plate II, fig. 2*k*), however, the tip, the externolateral spine, and the internolateral spines are proportionally much shorter.

*Character of surface.*—All females and all “mâles féminisés,” with the exceptions of Nos. 20 and 22, present no areas of spinules on the carapace, telson, or abdominal somites. Nos. 20 and 22 are slightly rough to the touch along the anterior part of the carapace. All of the young mature males and the old males show the characteristic areas of spinules described above for the largest male specimen.

*Eggs.*—The eggs of *P. philippinensis*, when preserved, measure about 1 by 1.3 millimeters.

*Color of living specimen.*—*Palaemon philippinensis* is not brilliantly colored. The surface is translucent, showing an underlying ground color of gray which is usually punctated on the dorsal and lateral regions of the abdomen and carapace with fine brownish red dots. The telson is usually bright brownish red in color, although not conspicuously so. The following striking pigment marks which may be seen through the translucent carapace are characteristic of the species (Plate II, fig. 2*m*) :

1. Two usually brownish black lines running longitudinally on each side of the dorsal median line of the carapace.
2. A conspicuous T-shaped dark pigment mark seen on the posterior part of each gill cover.
3. Usually a dark, obliquely placed pigment mark immediately back of the hepatic spine.

The first and second antennæ are marked with brownish red and show no blue color. Along the ventral border of the pleura of the fourth and fifth abdominal somites is a purple band. The first, third, fourth, and fifth legs are translucent and punctated with reddish brown dots, while the chelipeds are dark in color and marked longitudinally with dark greenish bands. The color of the pigment varies somewhat in different specimens and also probably in the same specimens at different times. The color disappears almost entirely after preservation. In the young mature males and sometimes in the adult males a covering of brownish sediment often obscures the color, but the sediment may be rubbed off, leaving the markings visible.

*Localities.*—We have in our collection 31 males and 8 females, all but one of which were taken in San Juan River (usually

<sup>32</sup> *Zool. Jahrb., Systematik* (1891), 5, Tafel XLVII, Fig. 4.

fresh) which empties into Pasig River near Manila. The one specimen just mentioned was captured in an estero (brackish water) emptying into Pasig River in the city of Manila. It is very probable then that *P. philippinensis* might be taken in considerable numbers in brackish water.

*Palaemon sundaicus* Heller. Plate II, figs. 3 and 3a-f.

There is in our collection a fairly complete series of a palaemon which may be distinguished in life and sometimes in the preserved condition from other species found near Manila by the beautifully marbled or tortoise-shell-like markings on its chelipeds. This form is probably *Palaemon sundaicus* Heller," although there are certain differences which will be mentioned below. The young specimens in our collection agree very well with the descriptions of de Man and Coutière for *P. sundaicus*, but our series contains a number of much larger males exhibiting characters which have not been described by Heller, de Man,<sup>34</sup> or Coutière.<sup>35</sup> I regret that I have not been able to see the paper of Hilgendorf.<sup>36</sup>

A study of the females and the young males in our series shows how closely they resemble specimens of like size described by the authors mentioned above. The shape, length, and dental formula of the rostrum and also the relative lengths of the different segments of the chelipeds are strikingly similar. In our collection the males reach a larger size than the females, the former ranging from 59.5 to 108 millimeters, the latter from 53.5 to 89 millimeters. Unfortunately, both de Man and Coutière had small collections, the individuals of which were mostly females, and in all cases the males which they examined were no larger than the smallest males in our series.

The fingers of the chelipeds in all of our males except the smallest are covered with felted hair which increases in thickness as the animals become larger. This does not seem to be true of any of the males described by de Man or Coutière, although it must be mentioned that all of our specimens bearing this felt are larger than any specimens described by these authors. Another difference is that in our series we have males of medium size (young mature males) in which the fingers gape widely and in which the relative length of the segments of the chelipeds

<sup>34</sup> *Sitzungsber. Akad. d. Wiss., math.-nat. Klasse*, Wien (1862), 45, 415.

<sup>35</sup> *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien* (1892), 2, 437.

<sup>36</sup> *Ann. Sci. Nat., Zool.* (1900), 11, 332.

<sup>37</sup> *Land und Süßwasser-Dekapoden Ostafrikas* (1899), 130.

differs considerably from the specimens described by de Man and by Coutière.

The specimens listed in Table III were all seen by me while they were still alive. Judging from certain characteristic color markings, especially the pattern on the chelipeds, which were present in specimens of all sizes and sexes, one could not fail to include them under one species. Even the young mature males (Nos. 15 and 20) with the exceptionally long chelipeds showed the characteristic markings.

Notwithstanding the differences between our large males and the smaller males described by de Man, I do not feel justified in establishing a new species until larger collections of the Javan form are made.

While I have not been able to see any figures or specimens of the American species, *Palaemon acanthurus* Wiegmann,<sup>37</sup> except Ortmann's<sup>38</sup> drawing of the telson which agrees well with young individuals of this species, the descriptions indicate that it is a larger form, although I believe our series does not include the largest specimens to be found. The proportion of the palm to the fingers in old males and the shape of the rostrum are different, but the coat of felted hairs on the fingers of the males is present in both. I believe that *Palaemon acanthurus* Wiegmann and the form under consideration are closely related, and I should not be surprised if, when further collections of *Palaemon sundaicus* from Java are made, older males with more mature characters are brought to light which will ally the Javan species closer to *Palaemon acanthurus*.

*Rostrum and antennal scales.*—The position of the tip of the rostrum with reference to the tip of the antennal scale does not vary much in our specimens. In both males and females the tip may be even with, extend slightly beyond, or fail slightly to reach, the distal end of the scale. It is possible, however, that in larger males the rostrum may not extend so far forward.

*Curvature and dental formula of rostrum.*—There is little difference in the shape of the rostrum in the males and females of all ages. The distal third is turned upward somewhat, and there is in nearly every case a gentle convexity over the eye. Usually there are 3 rostral teeth on the carapace, the fourth being over the edge of the orbit, and rarely are there 2 or 4 on the carapace. The rostral ridge divides the lateral surface of the rostrum into an upper and a lower area which are of

<sup>37</sup> Arch. f. Naturgesch. (1836), 1, 150.

<sup>38</sup> Zool. Jahrb., Systematik (1891) 5, Tafel XLVII, Fig. 5.

about equal width. Usually those teeth which are near the distal end of the upper border are separated from one another more than those posterior to them. The first tooth is nearly always separated from the second tooth by a distance which is considerably greater than the distances separating the teeth immediately anterior to them. The dental formula for the specimens in the collection is  $\frac{9, 10, 11, 12, 13}{4, 5, 6, 7}$ , but the large majority of the females show a dental formula of  $\frac{10, 11}{5}$ .

*First pair of legs.*—The first legs extend beyond the tip of the antennal scale in all specimens; in the youngest, only the propodus is seen beyond it, but in larger specimens more of the first legs overreaches the scale, and finally in the largest individuals as much as one-third of the carpus extends beyond it.

*Chelipeds.*—The chelipeds in this species are approximately equal. All the females have chelipeds which are shorter than the body, and the same is true of practically all the males until they reach a length of about 77 millimeters. Beyond this size the chelipeds are usually longer than the body, and in certain specimens, Nos. 15, 16, and 17, which I consider to be young mature males, they are relatively long. In the largest female, No. 38, the tip of the merus extends beyond the antennal scale, while in the smallest female, No. 25, three-fourth of the carpus overreaches the scale. One of the largest males, No. 20, shows more than one-half of the merus beyond the scale, while in the smallest male only four-fifths of the carpus extends beyond it.

It will be seen, if reference is made to Table III, that the fingers of all individuals are shorter than the palm, except in Nos. 1 and 2, which are the smallest males in the series. In the case of the males the palm seems to grow much faster than the fingers, so that an individual 88 millimeters long (No. 14) has a palm one and two-thirds times as long as the fingers. One of the young mature males, No. 20, shows the palm to be one and three-fourths times as long as the fingers. The largest males in the series have chelipeds which are shorter than the body length except in the case of No. 23. At first sight I considered these specimens to be "mâles féminisés," but upon examining them more closely I find that they have well-developed spines on the carapace and abdominal somites and I am of the opinion that these individuals are old mature males whose chelipeds are regenerating. The palm of the largest male, No. 24, is a little more than one and one-half times the length of the fingers.



TABLE III.—*Palaemon sundauicus* Heller.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Carapace length (posterior face of eye to border of carapace).	Rostral formula.	Position of tip of rostrum with reference to antennal scale.	First pair of legs (extension beyond antennal scale).	Extension of chelipeds beyond antennal scale.
1	♂	mm. 59.5	mm. 14.0	10/5	Even	Propodus.	Four-fifths of carpus.
2	♂	66.5	15.5	12/5	do	Tip of carpus.	Do.
3	♂	66.5	16.0	11/5	do	do	Do.
4	♂	70.0	17.0	13/5	Slightly beyond	One-fourth of carpus.	Whole of carpus.
5	♂	71.0	18.5	11/4	Even	do	Do.
6	♂	71.0	17.0	11/5	Slightly beyond	Tip of carpus.	Do.
7	♂	75.0	18.5	9/4	do	do	Almost whole of carpus.
8	♂	*71.5	19.0	11/6	Slightly behind	do	Whole of carpus.
9	♂	77.0	19.0	11/5	Slightly beyond	do	Tip of merus.
10	♂	77.0	20.0	10/5	do	One-third of carpus	Carpus.
11	♂	82.0	20.5	12/6	do	do	Almost one-third of merus.
12	♂	82.0	20.5	11/6	do	do	Absent.
13	♂	82.0	22.5	11/5	do	do	Tip of merus.
14	♂	88.0	24.5	10/5	Even	do	Two-fifths of merus.
15	♂	90.0	24.0	11/5	Slightly beyond	One-third of carpus	One-half of merus.
16	♂	91.5	25.0	11/5	do	One-fourth of carpus	One-third of merus.
17	♂	93.5	26.0	10/6	do	Two-fifth of carpus	Absent.
18	♂	92.0	25.0	10/5	Considerably behind	Almost one-half of carpus	Do.
19	♂	*92.0	26.0	10/5	Slightly behind	One-third of carpus	Do.
20	♂	*(?)	26.0	(?)	(?)	Almost one-half of carpus	More than one-half of merus.
21	♂	100.5	28.0	11/5	Even	do	Absent.
22	♂	102.0	23.0	10/5	do	One-third of carpus	Almost all of carpus.
23	♂	107.0	23.0	10/5	do	do	Distal end of merus beyond.

No.	Sex.	Chelipeds.										Proportion of merus to carpus.
		Length of—						Total length beginning with ischium.	Gaping of fingers.	Felt on fingers.		
		Propodus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.					
24	♂	108.0	27.5	11/5	do	Slightly beyond	do	do	do	do	Do.	
25	♀	b 53.5	13.5	12/6	Slightly beyond	Slightly beyond	do	Propodus	do	Three-fourths of carpus.		
26	♀	b 54.0	13.0	11/5	do	do	do	do	do	One-third of carpus.		
27	♀	b 57.0	14.0	10/5	Even	Even	do	Tip of carpus	do	Three-fourths of carpus.		
28	♀	57.0	14.0	11/5	do	Slightly beyond	do	do	do	Seven-eighths of carpus.		
29	♀	60.0	15.0	11/5	Slightly behind	Slightly behind	do	do	do	Two-thirds of carpus.		
30	♀	63.0	16.0	11/5	Even	Even	do	do	do	Four-fifths of carpus.		
31	♀	66.0	16.5	10/5	Even	Even	do	One-fifth of carpus	do	Carpus.		
32	♀	63.5	16.0	11/5	Slightly beyond	Slightly beyond	do	do	do	Almost whole of carpus.		
33	♀	b 74.0	18.0	10/5	Slightly behind	Slightly behind	do	One-fourth of carpus	do	Do.		
34	♀	75.5	19.5	11/6	Even	Even	do	One-fifth of carpus	do	Carpus.		
35	♀	79.0	20.0	11/5	do	do	do	Tip of carpus	do	Tip of merus.		
36	♀	79.0	21.0	10/5	Slightly behind	Slightly behind	do	One-fifth of carpus	do	Almost all of carpus.		
37	♀	87.0	23.0	10/5	Even	Even	do	One-fifth of carpus	do	Carpus.		
38	♀	89.0	23.5	10/5	Slightly behind	Slightly behind	do	One-third of carpus	do	Tip of merus.		

No.	Sex.	Chelipeds.										Proportion of merus to carpus.
		Length of—						Total length beginning with ischium.	Gaping of fingers.	Felt on fingers.		
		Propodus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.					
1	♂	mm. 17.0	mm. 8.5	mm. 8.5	mm. 12.0	mm. 9.0	mm. 8.0	mm. 46.0	None	None	1.33	
2	♂	mm. 17.0	mm. 8.5	mm. 8.5	mm. 15.0	mm. 10.0	mm. 8.5	mm. 50.5	do	do	1.50	
3	♂	mm. 17.5	mm. 8.0	mm. 9.5	mm. 15.0	mm. 11.0	mm. 8.0	mm. 51.5	do	do	1.36	
4	♂	mm. 22.5	mm. 10.0	mm. 12.5	mm. 19.5	mm. 12.0	mm. 10.0	mm. 64.0	do	Short, but present on both fingers.	1.62	
5	♂	mm. 19.5	mm. 9.0	mm. 10.5	mm. 18.5	mm. 11.5	mm. 10.0	mm. 59.5	do	Present, but shorter than in No. 4.	1.60	
6	♂	mm. 24.0	mm. 9.5	mm. 14.5	mm. 19.5	mm. 13.0	mm. 10.0	mm. 66.5	do	Short, but fairly well developed.	1.50	

a Tip of rostrum broken.

b Without eggs.

TABLE III.—*Palaeomon sundaius* Heller—Continued.

No.		Sex.	Chelipeds.										Felt on fingers.	Proportion of merus to carpus.
			Length of—						Total length beginning with ischium.	Gaping of fingers.				
			Pro-podus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.						
			mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.			
7	♂		21.0	9.0	12.0	18.0	12.0	11.0	62.0	None		Very short	1.50	
8	♂		26.0	11.0	15.0	22.0	14.0	11.0	73.0	do		Short, but fairly well developed.	1.57	
9	♂		28.5	12.0	16.5	23.0	15.0	12.0	78.5	do		do	1.53	
10	♂		25.0	10.0	15.0	21.5	14.0	11.0	71.5	do		Shorter	1.53	
11	♂		32.0	13.0	19.0	29.0	17.5	13.0	91.5	do		Short, but fairly well developed.	1.65	
12	♂													
13	♂		32.5	13.0	19.5	23.5	17.0	13.5	91.5	None		Short, but fairly well developed.	1.64	
14	♂		40.5	15.5	25.0	34.0	20.0	15.0	109.5	do		Increasing	1.70	
15	♂		55.5	21.5	34.0	48.0	27.0	17.0	147.5	Wide gape		Thick	1.77	
16	♂		42.5	16.5	26.0	34.5	21.0	16.0	114.0	Slight gape		Well developed coat	1.64	
17	♂													
18	♂													
19	♂													
20	♂		55.0	20.0	35.0	48.0	31.0	19.0	153.0	Wide gape		Thick	1.54	
21	♂													
22	♂		30.0	12.0	18.0	25.0	19.0	14.0	88.0	None		Short	1.31	
23	♂		40.0	15.0	25.0	32.0	22.5	15.0	109.5	Slight gape		do	1.42	
24	♂		34.5	13.5	21.0	30.0	21.0	15.0	100.5	None		do	1.42	
25	♀		13.0	6.0	7.0	12.0	8.5	7.0	40.5	do		Absent	1.41	
26	♀		14.5	6.5	8.0	10.5	8.0	7.0	40.0	do		do	1.31	
27	♀		14.5	7.0	7.5	11.0	8.5	6.5	40.5	do		do	1.29	

28	♂	16.0	7.0	9.0	12.0	8.5	8.0	44.5	do	do	1.41
29	♀	17.0	8.0	9.0	12.0	9.0	7.0	45.0	do	do	1.33
30	♀	18.0	7.0	11.0	15.0	10.0	8.5	51.5	do	do	1.50
31	♀	20.0	9.0	11.0	15.0	10.0	9.0	54.0	do	do	1.50
32	♀	16.5	7.5	9.0	15.0	10.0	9.0	50.5	do	do	1.50
33	♀	23.0	10.0	13.0	18.0	12.0	9.5	62.5	do	do	1.50
34	♀	23.0	11.0	12.0	17.0	11.5	10.0	61.5	do	do	1.47
35	♀	25.0	11.0	14.0	21.0	14.0	11.0	71.0	do	do	1.50
36	♀	25.0	11.0	14.0	19.0	13.5	10.5	68.0	do	do	1.40
37	♀	26.5	11.5	15.0	23.0	14.0	11.5	75.0	do	do	1.64
38	♀	31.0	13.0	18.0	25.0	16.0	13.0	85.0	do	do	1.56

\* Right cheliped only present, and this very short. Probably regenerating.

The fingers and palm are more nearly of the same length in the females, the palm being one and two-fifths times as long as the fingers in the largest individual. All of the male individuals, except the three smallest (Nos. 1, 2, 3), have both fingers of the chelipeds covered with felted hair, a condition which is not found in the females. The fingers of both males and females are slender, and each has a rather low cutting edge, extending from the teeth to the tip. The youngest males (Nos. 1 and 2) and all the females, except No. 25, show 2 teeth on the mobile and 1 tooth on the immobile finger. In No. 25 only 1 tooth is seen, and this is situated on the mobile finger. The males, Nos. 3 to 13 and 22 to 24, inclusive, show 2 teeth on the mobile finger and 2 on the immobile, but in the young mature males the teeth on the immobile finger are increased in number by the addition of 2, 3, or even 4 confluent teeth, which are situated between the most proximal of the two teeth just mentioned and the joint, a condition which is characteristic of mature males in some other species at least.

The palm is almost cylindrical, that of the smallest measuring 2 by 2.5 millimeters at its middle and that of the large male, No. 20, measuring 4.5 by 5 millimeters at a similar point.

The carpus is cylindrical in cross section, and increases gradually in diameter passing from the proximal to the distal end. It is shorter than the propodus and longer than the palm, but it does not increase in length so fast as does the palm. In the mature males there is a slight swelling of the carpus a little posterior to the distal end.

The proportion of the merus to the carpus ranges from 1 : 1.33 to 1 : 1.77, and the measurements indicate that the carpus grows faster than the merus. The latter is slightly longer than the palm in the young but slightly shorter in old individuals. It is always shorter than the carpus and longer than the fingers. The merus, which is flattened dorsoventrally along the proximal part, becomes almost cylindrical and of greater diameter at the distal part.

As in other palaemons, the merus grows faster than the ischium, so that the proportion between the ischium and merus increases with increasing body length. In the young mature males this increase is especially evident. The ischium is flattened dorsoventrally, the upper and lower surfaces being divided into two regions by a median longitudinal groove.

*Third, fourth, and fifth legs.*—The third, fourth, and fifth legs extend with their dactyli beyond the tip of the antennal scale in young individuals of both sexes. In older individuals as much

as one-fifth or one-third of the dactyli may extend beyond. The propodus of the fifth leg (No. 1) measures 0.5 millimeter in diameter at its middle and 8.75 millimeters in length. Similar measurements for Nos. 24, 25, and 38 are 0.8 by 15, 0.3 by 7.5, and 0.6 by 13 millimeters, respectively.

*Telson.*—Specimens in which the telson has not been worn show the internolateral spines extending about two-thirds of their length beyond the acute median spine. The externolateral spines are short and of about the same length as the median spine. In some specimens the tip of the telson is worn and the internolateral spines are considerably shortened.

*Character of surface.*—The carapace and abdominal somites of all females and males (Nos. 1 to 13, inclusive) are smooth to the touch, and show no spines under a lens. Male specimens larger than these have patches of spinules on the carapace, pleura of abdomen, tergum of sixth somite, upper surface of uropods, and the telson. These spinules are especially numerous on the young mature males, and the surface is distinctly rough to the touch. The surface of the first pair of legs is smooth, except in the old males where the ischium and part of the merus are covered with a few spinules. The spines on the chelipeds make their appearance at an early age. Specimen 1 shows a few rather indistinct rows of spines on the palm and distal half of the carpus. The area of spines increases with the body length, so that in No. 4 it covers the proximal end of the finger, the palm, the carpus, and the distal half of the merus. In No. 8 the condition is similar except that the ischium also is covered. Young mature males, as an example, No. 20, show a few spines at the proximal end of the fingers and about 12 longitudinal rows of medium-sized spines, which are distributed on the inner, ventral, and dorsal surfaces of the palm. The outer surface of the palm is covered with innumerable very small spines, which are not arranged regularly in rows. A similar condition exists on the carpus, merus, and ischium. The dorsal and ventral "linear spaces" are visible especially on the palm, carpus, and merus. In middle-sized specimens the "linear spaces" are more conspicuous. The third, fourth, and fifth legs are smooth in all but the largest males, where the propodus, carpus, and sometimes the merus are covered with very minute spinules.

*Eggs.*—The eggs of this species when preserved are almost spherical, and average 0.5 by 0.46 millimeter.

*Color of the living specimens.*—The general surface of the body owes its color mainly to the layer of pigment cells under the transparent chitinous covering. The color is not always the

same in any one individual. It may range from green to blue or even to brick red, and in old specimens these colors may be partially obscured. No T-shaped, L-shaped, or diagonal markings are seen under the sides of the carapace, but in living specimens the chelipeds are conspicuously marked, so as to appear like tortoise shell (Plate II, fig. 3c). These markings, which are probably the same as the marbled markings spoken of by de Man, sometimes persist temporarily after preservation, but usually disappear as do all other colors mentioned. The uropods are colored a conspicuous red, and there is a purple spot on the postero-lateral portion of the exopodite. The internal flagella of the first pair of antennæ are marked on their dorsal surface with bright yellow, and similar yellow spots are also seen on the uropods and telson. The color notes which have just been given apply to both sexes, but there are certain markings which distinguish the males from the females. A cream-colored transverse band on the tergum of the third abdominal somite is present in all the females of this species, but in the males it is much reduced in size or almost absent. This band is found in some other species which are described below. In the females the ventral border of the pleura of the fourth and fifth somites has a blood-red color which is absent in the males.

*Localities.*—We have in our collection 73 females and 24 males. Most of these were collected in Obando River flowing into Manila Bay near Manila (brackish water); some were taken in San Francisco River (usually fresh), which is a branch of Pasig River; others were obtained from an estero (often brackish) emptying into Pasig River within the city of Manila. Nos. 2, 6, 7, 9, 12, 17, 19, and 21 (Table III) are from San Francisco River.

*Palaemon lanceifrons* Dana. Plate II, figs. 4 and 4a.

The collection contains several palaemons which agree well with Dana's<sup>39</sup> description of *Palaemon lanceifrons*. The fingers of the chelipeds are about equal to the palm in most specimens, although in the old mature males (Dana's specimen was evidently a rather old male) the fingers are considerably shorter than the palm and are two-fifths of the length of the propodus. (Plate II, figs. 4 and 4a.) The propodus is a little longer than the carpus in all cases and a little slenderer. Characteristic tubercles (not mentioned in Dana's description), teeth, and thick hair are

<sup>39</sup> United States Exploring Expedition, Crustacea (1852-1854), 13, 589.

present on the fingers. These structures are described below in a description of a local form of this species.

The dental formula is  $\frac{10, 11, 12, 13}{3, 4, 5}$ , and the shape and size of the head and rostrum agree very well with Dana's figure. The rostrum never extends beyond the antennal scale, and is decidedly convex over the eye in older specimens.

The general surface of the body is sometimes dark and sometimes light. The color is due partly to closely set brownish pigment spots, which often have a dark reddish tinge, and in addition to this ground color there are patches of yellowish cream flecks scattered over the surface. Usually the tips of the uropods and the telson have a reddish brown color. The characteristic markings of this species (Plate II, fig. 5g) are an almost straight diagonal mark, an inverted V-shaped mark, and 2 marks shaped like an inverted L. These are often bluish in color, and may always be seen more or less clearly on the sides of the carapace. The horizontal limb of the anterior inverted L extends posteriorly from the anterior border of the carapace, ventral to the spines. The posterior inverted L is situated back of the anterior inverted L, and its horizontal limb is on a level considerably higher than that of the former. The diagonal mark, which really lies on the tissues beneath the carapace and is seen on account of the transparency of the latter, extends from the point where the horizontal and vertical limbs of the posterior L meet to the posterior margin of the carapace. Finally, the inverted V-shaped mark lies directly above the anterior L. The first and second antennæ are never colored blue, but are usually marked, especially in the male, with reddish brown transverse bars. The second legs or chelipeds are mottled in a manner somewhat similar to that of *Palaemon sundaicus*, but the coloring is reddish brown and greenish cream, and does not resemble tortoise shell in appearance.

*Palaemon lanceifrons* Dana, judging from our specimens, is distinct from *Palaemon idae* Heller. The carpus is always shorter than the propodus, and the proportion is about the same throughout the series. Furthermore, the chelipeds of *P. lanceifrons* are thicker and the rostrum is broader.

I agree with de Man's statement that *P. lanceifrons* is distinct from *P. sundaicus*. The shape of the rostrum, the shape of the different. The color markings and the tubercles on the fingers, fingers, and the distribution of the hair on the fingers are



which are seen in our specimens of *P. lanceifrons*, are absent in *P. sundaicus*.

*Palaemon lanceifrons* is not the young of *Palaemon philippinensis*. The latter has differently shaped fingers, there is no thick coating of hair on them, the eggs are much larger, and the color markings are different.

De Man's<sup>40</sup> suggestion that *Palaemon lanceifrons* Dana is possibly identical with *Palaemon dispar* von Martens receives considerable support from my observations. I believe that the former is very closely related to the latter, the only differences being found in the shape of the rostrum, the number of proximal teeth on the fingers, the number of distal tubercles on the fingers, and the shape of the tip of the immobile finger. Further collections and an actual comparison of specimens of the two species may show them to be identical.

There are 9 males and 24 females of this species in the collection; they were all purchased in a Manila market. Nearly all the females bear eggs. These measure from 0.5 to 0.7 by 0.6 to 0.8 millimeter.

A local form of *Palaemon lanceifrons* Dana, collected in San Juan River near Manila, differs slightly from the specimens just described. Except for minor differences, the chelipeds have the same proportions and general characteristics. The rostral formula is practically the same, but the rostrum is slightly longer and is less convex over the eye.

*Rostrum and antennal scale*.—The rostrum extends about as far forward as the antennal scale, but in some cases fails to reach it or extends beyond it a very short distance.

*Curvature and dental formula of rostrum*.—The shape of the rostrum does not vary much, but it must be added that there are not many individuals in the collection and that they do not show a very great range in size. The tip of the rostrum of old and middle-aged specimens turns up slightly, but in the young it is straight. The rostrum usually has its origin rather far forward on the carapace, but in Nos. 5, 7, and 8 (Table IV) it arises from about the middle of the same. Usually, there are 2 teeth on the carapace, and the 4 distal teeth at the tip of the rostrum are more widely separated than the rest. The first and second teeth are more widely separated than those immediately anterior to them. The lateral surface of the rostrum is divided

<sup>40</sup> Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien (1892), 2, 419.

into an upper wider and a lower narrower region by the usual ridge. The dental formula varies somewhat  $\left(\frac{10, 11, 12, 13}{3, 4}\right)$ .

*First pair of legs.*—In young males about one-half of the propodus, in the middle-aged males the whole of the same segment, and in the old males the tip of the carpus extends beyond the antennal scale.

*Chelipeds.*—The chelipeds of the young specimen, No. 2, are equal in length, but in all the rest of the specimens in which the chelipeds are present they are unequal in length. This inequality seems to increase with age, and it seems probable that it is not due to injury and regeneration. Only in the mature males, Nos. 7 and 8, are the chelipeds as long as the body. In the youngest male only two-fifths of the carpus extends beyond the antennal scale, while in the mature males from one-fourth to one-third of the merus may be seen beyond it.

The fingers of the youngest male, No. 1, are longer than the palm, slightly older specimens show the fingers to be a little shorter than the palm, and the old mature males have fingers which are much shorter than the palm. In specimen 8 the proportion of the fingers to the palm is 1:1.66 (left cheliped) and 1:1.44 (right cheliped). Thick hair is not present on the fingers of the youngest specimens, Nos. 1 and 2, but it makes its appearance on both fingers in slightly older individuals. The mature males have a thick coating of hair, which covers all but the tip of the mobile finger. The immobile finger bears a small patch of hair, which is limited to a narrow region extending as far forward as the middle of the finger on both sides of the cutting edge. Four broad and inconspicuous tubercles bearing a few stiff hairs are present along the inner side of the cutting edge of the immobile finger. These are situated on the swollen distal half, and are only seen in the mature males, Nos. 7 and 8. The mobile fingers of the specimens just mentioned have 3 long low tubercles along the inner side of the cutting edge. They are situated on the distal half of the finger. The keel of the cutting edge is well developed but low in the young and middle-aged individuals, and it becomes reduced to a raised line in the mature males. The youngest male, No. 1, shows 2 teeth on the mobile finger and 1 tooth on the immobile finger, but these may be seen only through a strong lens. In specimen 3, the beginnings of 1 or 2 confluent teeth posterior to the large tooth of the immobile finger are present. In the mature males, Nos. 7 and 8, there is an indication of the beginning of a

TABLE IV.—*Palaemon lanceifrons* Dana.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Carpace length (posterior face of eye to border of carapace).	Rostral formula.	Position of tip of rostrum with reference to tip of antennal scale.	First pair of legs (extension beyond antennal scale).	Extension of chelipeds beyond antennal scale.
1	♂	49.0	11.0	11/3	Slightly beyond	One-half propodus	Two-fifths of carpus.
2	♂	55.0	12.5	10/3	Even	do	Do.
3	♂	58.0	14.0	10/3	Slightly beyond	do	Two-thirds of carpus.
4	♂	58.5	14.5	13/4	Even	Propodus beyond	One-half of carpus.
5	♂	58.5	15.0	11/4	Slightly behind	Tip of carpus	Six-sevenths of carpus.
6	♂	62.5	15.0	12/4	Slightly beyond	Propodus beyond	One-half of carpus.
7	♂	63.5	16.0	12/4	Slightly behind	do	Tip of merus. One-third of merus.
8	♂	64.0	16.5	11/4	Slightly beyond	Tip of carpus	One-fourth of merus. Whole of carpus.

Chelipeds.									
No.	Sex.	Length of—					Total length beginning with ischium.	Gaping of fingers.	Felt on fingers.
		Pro-podus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.		
1	♂	R. 8.5	4.5	4.0	8.0	5.5	5.0	None	None
2	♂	L. 9.5	4.0	5.5	9.0	6.5	6.0	do	do
		R. 9.5	4.5	5.0	9.0	6.5	6.0	do	do
3	♂	L. 13.0	6.0	7.0	11.0	7.5	6.5	do	Slight on both fingers
		R. 11.0	5.0	6.0	10.5	7.5	6.5	do	do
4	♂	L. 11.5	5.5	6.0	10.5	7.0	6.0	do	Slight
		R.							

Proportion of merus to carpus.

Felt on fingers.

Gaping of fingers.

Total length beginning with ischium.

Length of—

Pro-podus.

Fingers.

Palm.

Carpus.

Merus.

Ischium.

Total length beginning with ischium.

Gaping of fingers.

Felt on fingers.

Proportion of merus to carpus.

5	♂	L. 15.5 R. 14.0	7.0	8.5	14.0	9.0	7.5	46.0	do	Considerable on both fingers	1.55
6	♂	L. 12.0 R. 11.0	6.0	8.0	13.0	9.0	7.5	43.5	do	do	1.44
7	♂	L. 23.5 R. 23.0	9.0	14.5	21.0	14.0	8.5	67.0	Wide	Thick	1.50
8	♂	L. 32.0 R. 22.0	12.0	20.0	26.5	15.0	10.0	83.5	do	do	1.76
			9.0	13.0	18.0	13.0	8.0	61.0			1.38

third confluent tooth and the first or most anterior confluent tooth is almost separated from those back of it. The large tooth of the immobile finger measures 1 millimeter in height, and the teeth of the mobile finger are about half as high (No. 8).

The palm is cylindrical in cross section, and is always shorter than the carpus. The proportion of the palm to the carpus in the smallest specimen is 1:2, and in the largest mature male the length of the palm is contained about one and one-third times in that of the carpus (No. 8).

The carpus reaches its greatest diameter some distance posterior to the distal end in mature males, and is cylindrical in cross section. In all of our specimens it is shorter than the propodus, but only slightly so in the immature specimens (Nos. 1-6).

The proportion of the merus to the carpus ranges from 1:1.37 to 1:1.76. The former is always longer than the fingers, and it is longer than the palm except in the mature males (Nos. 7 and 8).

*Third, fourth, and fifth legs.*—In the smallest male the dactylus of the third leg, one-fourth of the propodus of the fourth, and one-half of the propodus of the fifth leg extend beyond the antennal scale. The propodus of the fifth leg measures 8 millimeters in length, and has a width of 0.33 millimeter at its middle point. One-half of the propodus of the third leg extends beyond the tip of the antennal scale in the largest male, and one-third of the same segment of the fourth and fifth legs overreaches the scale. The measurements for the propodus of the fifth leg are 11.5 by 0.5 millimeters.

*Telson.*—The telsons of the two largest males and the smallest male are damaged. The tip in uninjured specimens is subacute, the externolateral spines fail to reach the tip of the telson by a distance equal to their own lengths, and the internolateral spines extend with three-fifths (No. 7) and two-thirds (No. 1) of their lengths beyond the tip.

*Character of the surface.*—The carapace and abdominal somites of all specimens except the two largest males, Nos. 7 and 8, are smooth. The last-mentioned mature males have the usual spinules on the pleura of the abdomen, the tergum of the sixth somite, the uropods, the telson, and the carapace. No spines can be seen on the legs of the smallest specimen. The surface of the first legs is smooth in all individuals except in the two largest males, where a few spines may be seen on the ischium. The chelipeds of No. 1 are smooth, and in No. 2 a few spinules may be seen on the immobile finger, the palm, and the car-

pus, but these are only visible under rather high magnification. In older specimens the spines are larger and cover the proximal part of the immobile finger, the palm, the carpus, the merus, and the ischium. The spines on the chelipeds are inconspicuous, being broad, low, and subacute. "Linear spaces" cannot be distinguished. Very minute spinules may be seen, with the aid of a lens, on the propodus, carpus, and merus of the third, fourth, and fifth legs.

*Eggs.*—There are no females of this form in the collection.

*Color of the living specimens.*—The color of these specimens agrees with that of the typical *Palaemon lanceifrons* Dana, the pigment marks on the sides of the carapace being plainly visible.

*Locality.*—All of these specimens were captured in San Juan River near Manila.

*Palaemon lanceifrons* Dana var. *montalbanensis* var. nov. Plate II, figs. 6 and 6a-i.

I have collected from the water supply of the city of Manila at Montalban 72 specimens of a form which I consider to be a variety of *Palaemon lanceifrons* Dana and one which in some respects is very similar to *Palaemon elegans* de Man. It is characterized by the decided convexity and shortness of the rostrum, by the fingers being much shorter than the palm in large specimens, and by the presence of tubercles in older males along the sides of the cutting edge of the fingers.

This variety, which I have called *P. l.* var. *montalbanensis*, differs from *P. lanceifrons* as originally described by Dana in the following particulars: The number of teeth on the dorsal and ventral borders of the rostrum is less, the rostrum does not extend so far forward, and the carpus is considerably shorter than the propodus even in young specimens.

*Palaemon lanceifrons* var. *montalbanensis*, while very similar to *P. elegans* de Man, differs as follows: The number of teeth on the dorsal and ventral borders of the rostrum is less; the teeth at the distal end of the dorsal border of the rostrum are spaced more widely; the chelipeds are unequal in length except in the young; the relative length of the fingers and palm of the chelipeds is different; the segments of the chelipeds are thicker; and the tubercles along the sides of the cutting edge of the fingers are distributed differently. Judging from the 37 males and 35 females in our collection, the mature females are much smaller than the old males.

The following description applies to the large male listed as No. 12 in Table V. This specimen, which measures 65.5 milli-

meters in length, has a rostrum which reaches the tip of the peduncle of the first antenna. The dorsal border of the rostrum begins at the middle of the carapace, but in this region and for some distance forward it is without teeth. The ventral border curves upward moderately, the tip extends directly forward, and the ridge along the side of the rostrum divides the blade into a wide upper and narrow lower area. The rostral formula is  $\frac{9}{3}$ , and the proximal and distal teeth of the dorsal border are more widely separated than those between them. On the ventral border the 2 teeth are situated well back from the tip.

The slender first pair of legs extends with the whole of the propodus beyond the antennal scale.

The chelipeds which are decidedly unequal in length extend with from one-third to one-half of the merus beyond the scale, and are both considerably longer than the body. Of the two chelipeds, the left is the longer, measuring 87 millimeters from the tip to the proximal end of the ischium; the right measures 75 millimeters, and is slenderer. The description which follows applies to the left cheliped: The immobile finger curves in less sharply and extends farther forward than the mobile finger. It is considerably more than half as long as the palm (1 : 1.68), and is distinctly swollen along its distal half. The keel of the cutting edge is reduced to a raised line, but a short distance in front of the proximal end of the finger there is a well-developed triangular tooth measuring 1.5 millimeters in height, which meets the cutting edge of the mobile finger and aids in preventing the fingers from closing. Posterior to the tooth just mentioned is a row of 3 much smaller confluent teeth (4 in specimen 14). All of these teeth are obscured by a thick growth of hair, which is limited to a narrow region on both sides of the cutting edge as far forward as the middle of the finger. Along the inner side of the cutting edge of the distal portion of this finger is a row of 5 broad, low, and inconspicuous tubercles, which bear a few stiff hairs. The sharply curved mobile finger is covered, except at the tip, with a dense coat of hair and is not swollen. The keel of the cutting edge is reduced as in the case of the immobile finger. Along the cutting edge are 2 teeth, measuring 1 millimeter in height, which curve slightly posteriorly. The palm is cylindrical in cross section and considerably shorter than the carpus (1 : 1.26). The carpus, which reaches its greatest diameter some distance back from the distal end, is much shorter than the chela (1:1.28), while the merus, which is only slightly

flattened at the posterior end, is much shorter than the carpus (1:1.57). The dorsal and ventral surfaces of the ischium each present a median longitudinal groove. The lengths, in millimeters, of the parts just described are as follows: Propodus, 33.5; finger, 12.5; palm, 21; carpus, 26; merus, 16.5; ischium, 11; total, 87.

The telson of this specimen ends in a subacute spine. The externolateral spines do not extend to the end of the telson, and the internolateral spines extend with about half their length beyond the tip. (See below, description of telson of smaller specimens.)

Patches of poorly developed spines are present on the anterior part of the carapace. Similar spines are seen on the ventral and lateral parts of the pleura, the dorsal surface of the sixth somite, and the exposed parts of the dorsal and ventral surfaces of the uropods and the telson. These spines are especially numerous on the last three structures named. The ischium of the first legs and the distal segments of the third, fourth, and fifth legs are covered with very fine spines, which are scarcely stronger than stiff hairs. The immobile finger, palm, carpus, merus, and ischium of the chelipeds are armed with short blunt spines, which are larger in size and fewer in number on the inner than on the outer surface of these segments. The mobile finger is spineless. "Linear spaces" cannot be seen.

*Rostrum and peduncle of first antenna.*—An examination of the 72 specimens in our collection shows that the rostrum may extend as far as the tip of the peduncle of the first antenna, may extend slightly beyond it, or may fail to reach it. In no case does the rostrum extend to the tip of the antennal scale, and there is no indication that the rostrum decreases in proportional length with reference to the peduncle of the first antenna.

*Curvature and dental formula of rostrum.*—There is little variation in the shape of the rostrum, but in the old males the convexity of the dorsal border is much more pronounced than in the females or young males. The tip does not turn up, the rostrum begins about halfway back on the carapace, and 1 or 2 teeth have their origin on the carapace. In all specimens the distal teeth of the dorsal border are more widely separated from one another than the teeth immediately posterior to them, and in the old males the first 2 teeth on the carapace are slightly more separated than those which immediately follow. The ridge



along the side of the rostrum divides the blade into an upper and lower region, the former being the wider of the two in specimens of all ages. The dental formula is very constant in all specimens ( $\frac{8, 9, 10}{2, 3}$ ).

*First pair of legs.*—The first pair of legs in young males and mature females extends with the tip of the propodus beyond the antennal scale, but in the large males the whole propodus is seen beyond the scale.

*Chelipeds.*—The chelipeds of the smallest males and all the females are approximately equal. An examination of Table V shows that in the males the inequality between the chelipeds increases with the increase in body length and that the difference in length is most marked in those specimens which show mature characteristics (Nos. 7, 8, 12). While it is difficult to determine whether this unequal length is the result of injury and regeneration or whether this condition is always characteristic of uninjured middle-aged and old males, the fact that none of the specimens in the collection shows chelipeds of such unequal length that there can be no doubt that the smaller one is regenerating indicates that the inequality is characteristic. The chelipeds of the females (Nos. 15, 16, 17), the "mâles féminisés" (Nos. 9, 11, 13), and the young immature males are shorter than the body (Nos. 1, 2, 3, 4, 5, 6). Young mature males and old mature males have the chelipeds longer than the body (Nos. 7, 8, 10, 12). In the smallest males, one-half of the carpus extends beyond the antennal scale, while in the largest males one-third of the merus may be seen beyond. The females do not show a great range in size, and a small fraction of the carpus only extends beyond the antennal scale.

The fingers of the youngest male, No. 1, are longer than the palm, and those of the youngest female, No. 15, are equal in length to those of the palm; in slightly larger males and females the palm becomes longer than the fingers, and in some of the largest males the fingers are contained one and one-half times in the palm. All of the male individuals except the smallest one have felted hair on the mobile finger, a condition which is not found in the females. There is also hair on the immobile finger of the males, but this does not appear to be present until the individual has reached a considerable size (No. 6). The immobile finger of young mature males and old mature males (Nos. 7, 8, 10, 12, 14) is swollen, and bears from 5 to 8 tubercles along the inner side of the cutting edge. The mobile finger of the same specimens is conspicuously curved, and bears

TABLE V.—*Palaemon lanceifrons* Dana var. *montalbanensis* var. nov.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Cerapace length (posterior face of eye to posterior border of cerapace).	Rostral formula.	Position of tip of rostrum with reference to tip of peduncle of first antenna.	First pair of legs (extension beyond antennal scale).	Extension of chelipeds beyond antennal scale.
1	♂	37.0	8.5	9/3	Slightly beyond	One-half of propodus	One-half of carpus.
2	♂	a49.5	13.0			do	Do.
3	♂	51.0	13.0	8/3	Slightly beyond	Propodus	Two-thirds of carpus.
4	♂	53.0	13.5	8/2	do	do	Most of carpus.
5	♂	57.0	14.0	8/3	One-half way between tip of rostrum and tip of peduncle.	do	Two-thirds of carpus.
6	♂	b59.0	15.5	8/3	do	One-fifth of carpus	Almost whole of carpus.
7	♂	53.0	16.0	8/2	Slightly behind tip of peduncle	Propodus	Distal end of merus.
8	♂	57.5	15.0	9/3	Even with tip	Tip of carpus	One-third of merus.
9	♂	60.5	16.0	9/2	Slightly beyond	Propodus	Most of carpus.
10	♂	b63.0	17.0	8/2	Even	Tip of carpus	One-third of merus.
11	♂	65.0	18.0	9/3	Slightly beyond	Propodus	Most of carpus.
12	♂	65.5	18.0	9/2	Slightly behind	Tip of carpus	One-third of left merus.
13	♂	69.5	18.0	9/3	Slightly beyond	Two-thirds of propodus	Most of carpus.
14	♂	a <sup>b</sup> 70.0	19.0			Propodus beyond	One-third of merus.
15	♀	41.0	9.5	8/2	Slightly beyond	One-half of propodus	One-third of carpus.
16	♀	c46.0	11.0	10/2	do	do	Two-fifths of carpus.
17	♀	c51.5	11.5	9/3	do	do	Do.

a Estimated.

Rostrum broken.

b Right cheliped missing.

c With eggs.

TABLE V.—*Palaemon lanceifrons* Dana var. *montalbanensis* var. nov.—Continued.

No.	Sex.	Length of—						Total length beginning with ischium.	Gaping of fingers.	Felt on fingers.	Proportion of merus to carpus.
		Length of—									
		Pro-podus.	Fingers.	Palm.	Carpus.	Merus.	Ischium.				
1	♂	{ L. 8.0 R. 7.5	4.5	3.5	6.0	4.5	4.0	22.5	{ None	{ None	{ 1.33 1.44
2	♂	{ L. 11.0 R. 12.5	5.0	6.0	9.0	6.0	5.5	31.5	{ do	{ Slight on mobile finger	{ 1.50 1.53
3	♂	{ L. 12.0 R. 13.0	5.0	7.0	10.0	7.0	5.5	34.5	{ do	{ Considerable on mobile finger	{ 1.43 1.43
4	♂	{ L. 15.5 R. 14.0	7.0	8.5	12.5	8.0	6.0	42.0	{ do	{ Slight on mobile finger	{ 1.56 1.53
5	♂	{ L. 13.5 R. 14.0	6.0	7.5	11.0	8.0	6.0	38.5	{ do	{ do	{ 1.37 1.50
6	♂	{ L. 19.5 R. 19.5	9.0	10.5	15.0	10.0	8.0	52.5	{ do	{ Considerable on mobile and a little on immobile finger.	{ 1.50
7	♂	{ L. 26.0 R. 22.0	10.0	16.0	21.0	13.0	8.0	68.0	{ Wide	{ Thick on both fingers	{ 1.61 1.56
8	♂	{ L. 23.0 R. 26.0	11.0	18.0	24.0	14.5	8.5	76.0	{ do	{ do	{ 1.65 1.55
9	♂	{ L. 19.0 R. 16.5	8.0	11.0	13.5	9.5	7.0	49.0	{ None	{ Considerable on mobile finger	{ 1.42 1.47
10	♂	{ L. 33.5 R. 33.5	12.5	21.0	25.0	15.5	10.0	84.0	{ Wide	{ Thick on both fingers	{ 1.61
11	♂	{ L. 20.5 R. 25.0	9.5	11.0	16.0	11.0	8.0	55.0	{ None	{ Considerable on mobile finger	{ 1.45 1.56
12	♂	{ L. 33.5 R. 26.5	12.5	21.0	26.0	16.5	11.0	87.0	{ Wide	{ Thick on both fingers	{ 1.57 1.53

13	♂	L. 25.0 R. 21.5	10.0 8.0	15.0 13.5	19.0 18.0	12.5 11.5	10.0 9.0	66.5 60.0	Slight Wide	Considerable on mobile and immobile fingers. do.	1.52 1.56 1.64
14	♂	L. 34.5 R.	13.0	21.5	28.0	17.0	12.0	91.5			
15	♀	L. 7.0 R. 7.0	3.5 3.5	3.5 3.5	6.5 6.5	4.5 4.5	4.0 4.0	22.0 22.0	None	None	1.22 1.22
16	♀	L. 9.0 R. 9.0	4.0 4.0	5.0 5.0	6.5 7.0	5.0 5.0	5.0 5.0	25.5 26.0	do	do	1.30 1.40
17	♀	L. 9.0 R. 8.5	4.5 4.0	4.5 4.5	7.5 7.5	5.0 5.0	5.0 5.0	28.5 26.0	do	do	1.50 1.50

from 2 to 4 tubercles along a similar region. These characters do not appear in young males, "mâles féminisés," nor females. The keel of the cutting edge of both fingers in young males and all females is well developed but low. It decreases in height as the body length increases, so that in the oldest males it is only a raised line. In the youngest males and females (Nos. 1 and 15) no teeth can be seen on the fingers, but slightly older specimens (Nos. 2 and 16) show 2 teeth on the mobile and 1 tooth on the immobile finger. The condition last mentioned is characteristic of all the females of this species in our collection, except of No. 15, but an examination of the older males shows the presence of confluent teeth back of the tooth, mentioned above, on the immobile finger. These teeth make their first appearance in No. 3, being represented by 1 or 2 very small teeth, but with increasing body length the number increases to 3 or 4.

The palm is cylindrical in cross section, that of one of the large males (No. 12) measuring 4 millimeters and that of a small male (No. 3) measuring almost 2 millimeters in diameter at the middle point.

The carpus is also cylindrical in cross section, and in females, young males, and "mâles féminisés" it increases in diameter passing from the distal to the proximal end. The same is true for young mature and old mature males, except that the greatest diameter is reached some distance posterior to the distal end. The carpus is shorter than the propodus and longer than the palm or the fingers; the palm, however, grows faster than the carpus.

The proportion of the merus to the carpus ranges from 1:1.33 in the smallest male to 1:1.64 in the largest, showing that the carpus increases in length faster than the merus. The latter is longer than the palm and is of the same length as the fingers in the smallest male and shorter than the palm and longer than the fingers in the largest. The merus, as in other species, is flattened dorsoventrally along the proximal part, becoming almost cylindrical and of greater diameter in the distal region.

*Third, fourth, and fifth legs.*—In the smallest male, the dactyli of the third and fourth legs and the tip of the propodus of the fifth leg extend beyond the antennal scale. The propodus of the fifth leg measures 5.5 millimeters in length and 0.1 millimeter in diameter at the middle region. One of the oldest males (No. 12) shows one-third of the propodus of the third and fourth legs beyond the tip of the antennal scale, while in the fifth leg one-fourth of the propodus is seen beyond. The propodus of

the fifth leg measures 10.5 millimeters in length, and has a width of 0.5 millimeter at its middle point.

*Telson.*—The telson of a large male has been described above. In young specimens the telson tip is subacute, the externolateral spines extend posteriorly almost as far as the telson tip, and the internolateral spines overreach the tip by more than two-thirds of their length.

*Character of the surface.*—The carapace and abdominal somites of all females (Nos. 15, 16, 17), “mâle féminisés” (Nos. 9, 11, 13), and young immature males (Nos. 1, 2, 3, 4, 5, 6) are smooth to the touch, and show no spines under a lens. Young mature males and old mature males (Nos. 7, 8, 10, 12, 14) have spines on the carapace, pleura of the abdomen, tergum of the sixth somite, the uropods, and the telson. The surface of the first pair of legs is smooth, except in the old males where the ischium presents a few feeble spinules. No spines can be seen on the chelipeds of the smallest male and female specimens (Nos. 1 and 15). Very minute and feeble spinules, which can only be seen under a rather high power lens, are present on the palm, carpus, and merus of specimens Nos. 2 and 16. The spines are more conspicuous in specimens Nos. 3 and 17. In the medium-sized and large males, the spines become better developed than in any of the females. Specimen 4 and all individuals of greater body length have spines on the ischium in addition to the spines on the palm, carpus, and merus. Specimens 7 to 14, inclusive, have also a few spines on the immobile finger. The spines in this species are not conspicuous, being broad, low, and subacute in old males. The “linear spaces” cannot be distinguished. There are very minute spines present on the merus, carpus, and propodus of the third, fourth, and fifth legs, but these can only be seen in the old males.

*Eggs.*—The eggs of this variety when preserved measure from 0.5 to 0.7 by 0.7 to 1 millimeter. Those of *P. lanceifrons* measure from 0.5 to 0.7 by 0.6 to 0.8 millimeter. The eggs of both are smaller than those of *Palaemon elegans* de Man, which measure 1 to 1.1 by 1.4 to 1.5 millimeters.

*Color of the living specimens.*—The color of the general surface of the body is similar to that of *Palaemon lanceifrons* Dana. The pigment marks which are so characteristic of the carapace of the latter are plainly seen.

*Localities.*—There are 37 males and 35 females of this variety in our collection; all of them were collected below the dam at Montalban near Manila.

**Palaemon lar** Fabricius. Plate II, figs. 7 and 7a-h.

The widely distributed *Palaemon lar* Fabricius is represented in our collection by a large number of specimens, most of which were collected in Mindoro.

*Rostrum and penduncle of the first antenna.*—The rostrum in our specimens usually extends to a point slightly beyond or slightly behind the tip of the peduncle of the first antenna, but in one case it reaches to the tip of the antennal scale. In males possessing mature characters (chelipeds longer than the body and fingers gaping widely and with heavy teeth) the rostrum does not extend as far forward with reference to the tip of the antennal scale as in the younger, immature individuals.

*Curvature and dental formula of rostrum.*—In the youngest specimens the tip of the rostrum is straight and there is almost no convexity of the dorsal border of the rostrum, but older specimens show a slight upward curve of the tip and a gentle convexity over the eye. The first 2 rostral teeth are found on the carapace, and usually are separated from one another by a greater distance than are those farther forward. Frequently, the third tooth lies partly on the carapace. The lateral ridge on the rostrum divides the surface into an upper wider and a lower narrower region. The number of teeth does not vary through a very great range, the dental formula being  $\frac{7, 8}{2, 3, 4}$ .

*First pair of legs.*—The whole of the propodus extends beyond the tip of the antennal scale in all the specimens, and in most individuals this distance is increased by from one-fifth to one-third of the carpus.

*Chelipeds.*—The chelipeds of immature specimens are approximately equal in length except in cases where one cheliped is regenerating. Some of the mature males have chelipeds which are about equal in length, but as a rule there is considerable inequality. Here again, as in many other palaemons, it is impossible to determine from preserved specimens whether the inequality is the result of injury or whether it is a normal, characteristic condition. An interesting case is shown in Plate II, fig. 7b, where one of the chelipeds is considerably longer than the other but the palm of the former has a smaller diameter and the fingers are more weakly developed. Our collection does not include the oldest mature males which may attain a body length of almost 200 millimeters. Specimens 10 and 13 are young mature males, and their chelipeds are longer than the body. The younger immature males, the “mâles féminisés” (No. 12, Table VI), and the

females have chelipeds which are shorter than the body. In the youngest individuals, as a rule, the propodus and part of the carpus extend beyond the antennal scale, with increasing size the tip of the merus is seen beyond, and finally in the largest of our males from one-third to one-half of the merus overreaches the scale.

The fingers of all individuals of this species in our collection are shorter than the palm, in the young they are only slightly shorter, but in the largest specimens the length of the fingers is contained one and one-half times or more in the length of the palm. A few stiff hairs are present on the fingers, but there is no dense felt such as is seen in some other species. Young males, "mâles féminisés," and all the females show no gaping of the fingers, but in the old males the gape is very wide and the immobile finger extends a little beyond the mobile finger. There is no keel on the cutting edge of the fingers in the old males, but in other individuals it is present. Four or 5 small proximal teeth and 1 larger distal tooth are seen on the mobile finger of young males, "mâles féminisés," and all females, but in mature males the smaller teeth become reduced to 2 or 3 long inconspicuous tubercles and the large tooth becomes very much larger. On the immobile finger 1 tooth is present in the youngest males and females, but in older individuals (Nos. 7 to 13, inclusive) a second smaller and proximal tooth appears. These 2 teeth are well developed in the old males (figs. 7a and 7b).

The palm of the oldest males is almost cylindrical in cross section, but in younger individuals it is flattened laterally.

The carpus of young individuals is almost as long as the palm and longer than the fingers, but with increasing body length the palm becomes much longer than the carpus and even the fingers show a greater length than the latter. The cylindrical carpus is much wider at its distal than at its proximal end.

The merus is always longer than the carpus or the fingers. It is equal in length to the palm in young individuals, but much shorter in old specimens. The proportion of the merus to the carpus is very constant, varying from 1:0.75 to 1:0.93. The merus is flattened dorsoventrally at its proximal end, and in old individuals is much enlarged at its distal end.

*Third, fourth, and fifth legs.*—The tip of the dactylus of the third pair of legs extends slightly beyond the tip of the antennal scale in young specimens (No. 2). The dactylus of the fourth pair of legs fails to reach the tip of the scale by a short distance, and the dactylus of the fifth pair of legs extends slightly beyond the end of the carpus of the chelipeds. The propodus of the



TABLE VI.—*Palaemon lar Fabricius.*

No.	Sex.	Body length (tip of rostrum to tip of telson).	Carapace length (posterior face of eye to posterior border of carapace).	Rostral formula.	Position of tip of rostrum with reference to tip of peduncle of first antenna.	First pair of legs. Extension beyond antennal scale.	Extension beyond antennal scale.	Chelipeds.										Proportion of merus to carpus. Left cheliped excepting No. 14.
								Length of—					Total length, beginning with ischium.	Gaping of fingers.	Hairs on fingers.			
								Propodus.	Fingers.	Palm.	Carpus.	Merus.				Ischium.		
1	♂	55.0	15.0	7/2	Slightly behind.	Tip of carpus	L. one-half of carpus. R. two-fifths of carpus.	12.0 11.0	5.0 5.0	7.0 6.0	6.5 5.5	7.0 6.5	6.5 6.0	32.0 29.0	Sparsely hairy. None	0.93		
2	♂	64.0	16.5	8/4	Even with tip of antennal scale.	do	L. one-third of carpus. R. one-third of carpus.	14.5 14.0	7.0 6.5	7.5 7.5	7.0 7.0	7.5 7.5	7.5 7.5	36.5 36.0	do	0.93		
3	♂	70.6	18.5	7/3	Slightly behind.	do	L. four-fifths of palm. R. palm.	13.0	6.0	7.0	6.0	8.0	7.0	34.0		0.75		
4	♂	71.0	19.0	8/2	do	One-third of carpus.	L. one-half of carpus. R. three-fifths of carpus.	14.5 17.5	7.0 8.5	7.5 9.0	6.0 7.0	8.0 9.0	7.0 7.0	35.5 40.5	do do	0.78		

5	♂	78.0	20.0	8/8	Even with tip of antennal scale.	Propodus	L. one-third of carpus.	19.0	9.0	10.0	9.0	47.1	do	do	0.91
							R. two-fifths of carpus.	19.5	9.0	10.5	10.0	9.0	48.5		
6	♂	92.5	27.0	(*)	Even with tip of peduncle.	One-fourth of carpus.	L. four-fifths of carpus.	33.5	15.5	18.0	14.0	16.0	75.5	do	0.87
							R. four-fifths of carpus.	33.0	15.0	18.0	13.0	16.0	74.0		
7	♂	94.0	26.5	8/2	do	One-fifth of carpus.	L. tip of merus	40.5	16.5	24.0	14.9	17.0	84.4	Slight	0.88
							do	40.5	16.5	24.0	15.0	17.5	85.0		
8	♂	103.0	29.5	8/3	do	One-sixth of carpus.	L. carpus	45.0	19.0	26.0	16.0	18.5	92.5	Very slight	0.87
							R. almost whole of carpus.	43.0	18.0	25.0	16.0	19.0	91.5		
9	♂	106.0	32.0	8/4	do	do	L. tip of merus	46.0	19.0	27.0	18.0	21.0	99.0	do	0.86
							R. five-sixths of carpus.	38.0	16.0	22.0	16.0	18.0	85.0		
10	♂	114.0	35.0	7/3	do	One-third of carpus.	L. two-fifths of merus.	81.0	35.0	46.0	27.0	32.0	158.0	Gape very wide <sup>b</sup>	0.84
							R. one-third of merus.	82.5	36.5	46.0	25.0	28.5	153.0		
11	♂	118.0	36.0	8/2	Fails to reach tip of peduncle.	Propodus	L. carpus	49.5	21.0	28.5	20.0	22.0	106.5	L. very slight.	0.91
							R. tip of merus	58.0	25.0	33.0	19.0	22.5	114.5	R. slight	
12	♂	121.0	33.0	7/3	Slightly beyond	One-fifth of carpus.	L. carpus	41.0	18.0	23.0	18.0	20.5	94.0	None	0.88
							R. carpus	40.5	17.5	23.0	17.5	21.0	94.0		
13	♂	127.0	39.0	7/3	Even	One-third of carpus.	L. two-fifths of merus.	102.0	41.0	61.0	30.5	35.5	188.5	Wide	0.86
							R. one-half of merus.	88.5	35.0	53.5	32.0	38.0	179.5		
14	♀	125.0	34.5	8/2	Even with tip of antennal scale.	Tip of carpus	R. one-half of carpus. <sup>(d)</sup>	33.0	15.0	18.0	13.0	16.0	75.0	None	0.81

\* Abnormal.

<sup>b</sup> Gape especially wide between fingers of right cheliped. Palm of right cheliped much wider than that of left cheliped.

\* Estimated. Fingers broken.

\* Left cheliped missing.

right fifth leg measures 0.5 millimeter in diameter at its middle point, and is 7 millimeters long. In old specimens (No. 13) the tip of the dactylus of the third leg extends slightly beyond the antennal scale, the tip of the dactylus of the fourth leg fails slightly to reach the tip of the scale, and one-fifth of the propodus of the fifth leg extends beyond the tip of the peduncle of the second antenna. The diameter of the propodus of the right fifth leg at the middle point is 1.5 millimeters, and its length is 17 millimeters.

*Telson.*—The tip of the telson (specimen 81 millimeters long and not listed in the table) is subacute, the externolateral spines fail by their own length to reach the level of the telson tip, and the internolateral spines extend with three-fifths of their entire length beyond the tip of the telson.

*Character of the surface.*—All specimens of *Palaemon lar* in our collection have smooth bodies. Even the largest males show no signs of the patches of spines which are found on the carapace, pleura of the abdominal somites, tergum of the sixth somite, uropods, and telson of mature males in some other species. The first legs are smooth in small specimens, but in medium-sized and large individuals the ischium is armed with short, heavy, inconspicuous spines. The chelipeds are well supplied with strongly developed subacute spines, which are arranged in rather definite longitudinal lines. These spines are found on all segments, and those on the inner side are the largest. Two sets of "linear spaces" can be distinguished in all middle-sized and large specimens. One set is found on the outer lateral surface of the palm, carpus, and merus, the other is found along the ventral surface of the same segments. The third, fourth, and fifth legs of young individuals have well-developed spines on the propodus, but the remaining segments are smooth. With increasing size more of the segments become spiny, until in the old males with mature chelipeds the dactylus, propodus, carpus, merus, and ischium have a coating of spines.

*Eggs.*—The average size of the preserved eggs of the single female specimen is 0.5 by 0.6 millimeter.

*Color of the living specimen.*—The carapace, abdomen, and telson of the male vary in color, being grayish brown, olive, or very dark blue. The uropods are usually olive or dark blue, with reddish brown around the edges. Very distinct orange-colored spots are seen on the sides of the abdomen at the junctions of the terga and pleura, except in the case of the third segment. There are no T- or L-shaped markings on the carapace. The first pair of legs is blue, tinged in places with pink; the

chelipeds are olive to a very dark blue, and show in places brown mottled markings; and the walking legs show a mixture of gray, blue, and brown. The color of the female is similar to that of the male, except that the ventral edges of the pleura are of a cream color. The colors are brighter in young than in old individuals.

*Localities.*—The collection contains 96 males and 1 female from Port Galera, Mindoro, 1 male from the settling basin of the Manila water works near San Juan del Monte, Luzon, Philippine Islands, and 5 males from Guam, Mariana Islands. The single specimen from the settling basin was collected by A. L. Day, and those from Guam by R. C. McGregor.

*Palaemon jaroensis* sp. nov. Plate III, figs. 8 and 8a-k.

The work of Coutière<sup>40a</sup> on *Palaemon lepidactylus* Hilgendorf and that of von Martens<sup>41</sup> on *Palaemon grandimanus* Randall indicate that there may be striking differences in the shape and proportion of the chela in a given species. The variability, especially of the former species, renders it difficult to determine whether or not one is dealing with a new species when examining specimens which are quite similar in certain respects to *Palaemon lepidactylus*, but which come from new localities.

The individuals of one series of specimens in our collection, although not showing much variability, remind one of *Palaemon lepidactylus* Hilgendorf.<sup>42</sup> After a careful examination I have decided that they belong to a new and distinct species which is closely related to *Palaemon placidus* de Man,<sup>43</sup> *Palaemon hilgendorfi* H. Coutière, and *Palaemon lepidactylus* Hilgendorf. This species to which I have given the name *Palaemon jaroensis* is represented in our collection by 23 specimens, of which 6 males and 2 females are perfect so far as the chelipeds are concerned. While there is considerable difference between the chelipeds of the females and those of the males, this is probably sexual. There is but little variability in the shape, proportions, and other characteristics of the large cheliped of the male specimens, and the same is true of the small cheliped, but there is a constant difference in the proportional length of the segments of the large cheliped when compared with those of the small cheliped of the same individual.

<sup>40a</sup> *Ann. Sci. Nat., Zool.* (1900), 11, 272.

<sup>41</sup> *Arch. f. Naturgesch.* (1868), 34, 45.

<sup>42</sup> *Monatsber. Preussischen Akad. d. Wissensch.* Berlin (1879), 838.

<sup>43</sup> *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien* (1892), 2, 483.

TABLE VII.—*Palaemon jaroensis* sp. nov.

No.	Sex.	Body length (tip of rostrum to tip of telson).	Carapace length (posterior face of eye to posterior border of carapace).	Rostral formula.	Position of tip of rostrum with reference to tip of peduncle of first antenna.	First pair of legs (extension beyond antennal scale).	Chelipeds.										Hair on fingers.	Proportion of merus to carpus.
							Length of—			Thickness of palm.	Length of—			Width of palm.				
							Propodus.	Fingers.	Palm.		Carpus.	Merus.	Ischium.		Total length beginning with ischium.			
1	♂	65.0	21.0	12/2	Fails to reach end of peduncle	Three-fifths of carpus	R. 42.5 21.0 21.5 10.0 L. 23.0 16.0 12.0 6.5	7.0 20.0 17.0 9.0 38.5	9.0 38.5	Wide	Thick	1.17						
2	♂	65.0	21.0	11/2	do	do	R. 42.0 20.0 22.0 10.0 L. 23.0 15.0 13.0 7.0	5.0 14.5 12.5 8.5 63.5	8.5 63.5	do	do	1.16						
3	♂	67.0	22.0	11/2	do	Two-fifths of carpus	R. 42.5 19.0 23.5 10.5 L. 26.5 14.5 12.0 6.5	8.0 20.0 17.0 9.0 38.5	9.0 38.5	do	do	1.15						
4	♂	67.0	22.0	12/2	do	do	R. 23.0 13.0 11.0 6.0 L. 41.5 20.0 21.5 10.0	4.0 13.0 12.0 7.0 55.0	8.5 62.5	do	do	1.11						
5	♂	69.0	22.5	12/2	do	do	R. 37.0 19.0 18.0 8.0 L. 20.5 11.0 9.5 5.0	6.0 19.0 17.0 9.5 82.5	9.0 88.5	do	do	1.11						
6	♂	72.0	22.0	11/2	do	do	R. 30.0 15.5 14.5 7.5 L. 46.0 21.0 25.0 11.5	5.0 15.0 13.0 8.0 65.5	7.0 48.5	do	do	1.10						
7	♀	60.0	16.5	11/2	do	Three-fifths of carpus	R. 15.0 8.0 7.0 3.5 L. 12.5 7.0 6.5 3.0	7.0 38.0	10.0 96.0	do	do	1.10						
8	♀	62.0	18.0	11/2	do	do	R. 16.0 7.0 9.0 3.0 L. 16.0 7.0 9.0 3.0	8.0 7.0 6.5 3.0 34.0	9.0 40.5	do	do	1.05						
								9.0 7.0 41.0	do	do	do	1.00						

\* Estimated. Telson broken.

b Thick hair absent.

c Estimated. Rostrum broken.

The following description applies to the largest male (No. 6, Table VII), which is 72 millimeters long. The rostrum almost reaches the tip of the peduncle of the first antenna and has the formula  $\frac{11}{2}$ . It is convex over the eye, dipping sharply anteriorly and then extending horizontally at the tip. The teeth on the carapace are more widely separated than those immediately anterior to them, and the first one is situated a little more than two-thirds of the distance from the posterior edge of the carapace to the border of the orbit.

The first pair of legs extends with two-fifths of the carpus beyond the antennal scale.

The chelipeds are decidedly unequal in size and length but similar in shape, a condition which is found in all the males of *P. jaroensis* in our collection and one which may be characteristic of all middle-aged and old males of this species. In the case of the larger cheliped, which measures 96 millimeters in length, one-third of the merus extends beyond the antennal scale. The mobile finger curves sharply, while the immobile finger is practically straight, and when their tips meet a considerable space is seen between them. Along the proximal portion of the cutting edge of the immobile finger are 6 blunt, fairly well-developed teeth which are not situated upon a raised ridge. The 4 nearest the palm are confluent. Following the 6 teeth is a space, and distal to this is a series of 11 blunt teeth arranged at rather regular intervals along the cutting edge and extending almost to the tip of the finger. The most proximal one of these is larger than the rest. A series of 9 similar teeth are present along the inner side of the cutting edge, but the teeth are not upon the latter. There is no large tooth corresponding to the one on the cutting edge. The toothing on the mobile finger consists of 3 rather large, blunt, irregular, proximal teeth and 2 distal series of smaller blunt teeth separated from the former by a space. As in the case of the immobile finger, the outer teeth are found on the cutting edge while the inner are not. There are 10 of the former and 8 of the latter, and there is no conspicuously large tooth at the beginning of either series.<sup>44</sup>

<sup>44</sup> An examination of the fingers on the large cheliped of smaller specimens shows that the dentition is similar, but that the number of teeth in the two series beyond the space may be much smaller, especially along the inner side of the finger, and that there is some variation in the number of proximal teeth. In the females very small proximal teeth are present and the keel of the cutting edge is well developed, but the proximal series of blunt teeth, so characteristic of the males, is not present on the fingers of either cheliped.

A thick growth of rather short hairs is present along the cutting edge of both fingers, and as a result the teeth described above are completely concealed.

The much flattened palm (11.5 millimeters wide and 8.5 millimeters thick) is longer than the fingers, the proportion of the length of the fingers to that of the palm being 1:1.19; the slightly flattened carpus which is smaller in diameter and shorter than the palm equals the fingers in length; and the merus is shorter than the carpus,<sup>45</sup> a condition which seems to be characteristic of *Palaemon placidus*, but not of *Palaemon hilgendorfi* or *Palaemon lepidactylus*.

The smaller cheliped measures 65.5 millimeters in length, and the distal end of the merus just reaches the tip of the antennal scale. It is similar in appearance to the large cheliped, but the relative lengths of the different segments are not the same. As in the case of the large cheliped the fingers gape, the mobile one curving rather sharply and the immobile one being practically straight. The dentition of the fingers is similar to that of the fingers of the large cheliped, except that the distal series of teeth along the inner side of each finger is made up of a smaller number of teeth and that there are 8 proximal teeth on the immobile finger instead of 6. The cutting edge of each finger is clothed with a heavy coat of short hairs which conceals the teeth.

The fingers (15.5 millimeters) are longer than the palm (14.5 millimeters), and this is true for the small cheliped of all the male specimens. The palm is flattened, and measures, at its widest point, 7.5 millimeters in width and 5 millimeters in thickness. The carpus is slightly longer than the palm, and the same is true for these 2 segments in the small cheliped of all the male specimens. As in the large cheliped the merus is shorter than the carpus.

The impression one receives from comparing the large and small chelipeds of the same individual is that the smaller is merely a younger stage in the development of the larger, that if the specimen had lived and molted the palm of the former would have increased in length at a faster rate than the carpus, and that finally the small cheliped would have assumed the form, size, proportions, and general characteristics of the larger cheliped. It is impossible to determine, however, with the specimens

<sup>45</sup> All the males of this species in our collection show a similar condition, but in the females the carpus and merus are about equal, and it is probable that the latter is true of young males.

at hand if the two chelipeds ever become more nearly alike in older individuals.

The tip of the telson is acute, but the lateral spines are worn, and some of them are absent from the specimen under consideration. In another male specimen with a more perfect telson the externolateral spines are very short and the internolateral spines extend beyond the tip of the telson with one-half of their length.

The carpus, abdominal segments, and uropods are smooth, but the second, third, fourth, and fifth legs are well covered with heavy spines. In general, the spines are much like those of *Palaemon lepidactylus* Hilgendorf, except that there are no conical spines on the superior <sup>45a</sup> and inner surfaces of the palm of the cheliped and that in the place of these there are pointed, flattened spines, whose upper surfaces are concave and whose lower surfaces are convex. Also, these spines are found on the fingers as in the case of *Palaemon lepidactylus* Hilgendorf. "Linear spaces" are present on the palm, carpus, and merus of both chelipeds.

The third, fourth, and fifth legs are stout in comparison with those of most other palaemons. There is little difference in the length of these legs; the fifth is the shortest. One-third of the propodus of the third leg and the tip of the dactylus of the fourth leg extend beyond the tip of the antennal scale, but the fifth leg extends only slightly beyond the tip of the peduncle of the second antenna. The propodus of the fifth leg measures 9 millimeters in length and 1.1 millimeters in diameter at its middle point.

The two females listed in Table VII are the only perfect ones in the collection. The right and left chelipeds in each specimen are nearly the same in size and shape. No distal teeth are present, but there is a well-developed keel on the cutting edge of both fingers, and this keel is partially concealed by a sparse growth of hair. One female, which is not listed in Table VII, carries eggs, and the measurements of these average 0.7 by 0.5 millimeter.

The 18 males and 5 females of this new species were taken in Hibucawan River, near Jaro, Leyte, by Alvin Seale and Urbano Villamor.

*Palaemon lepidactylus* Hilgendorf. Plate III, figs. 9 and 9a-b.

A rare species known as *Palaemon lepidactylus* Hilgendorf is represented in our collection by 2 male specimens. Both individuals are rather small, and one has the chelipeds missing; the

<sup>45a</sup> That is, the border which is continuous with the immobile finger.



uninjured individual has these appendages well developed. The body length of the latter is 58.5 millimeters and the carapace length, 18.5 millimeters; the other has a body length of 66 millimeters and a carapace length of 20 millimeters. The following description applies to the smaller specimen:

The rostrum extends slightly beyond the middle segment of the peduncle of the first antenna, and the first tooth on the dorsal border is 7 millimeters posterior to the anterior edge of the carapace. Five teeth are situated on the carapace, and these are more widely separated from one another than those anterior to them. The dorsal border dips anteriorly, showing only a slight convexity over the eye. The lateral ridges of the rostrum divide the lateral surface into an upper, wider region and a lower, narrower region. The dental formula of the specimen under consideration is  $\frac{13}{2}$ , while that of the other is  $\frac{12}{2}$ .

Three-fifths of the carpus of the first pair of legs extends beyond the tip of the antennal scale.

The chelipeds are decidedly unequal in length and different in form, the larger being much longer than the body. One-half of the merus of the larger (left) and one-fifth of the merus of the smaller extend beyond the antennal scale. The slightly gaping fingers of the large cheliped are much longer than the palm, the length of the mobile finger being 25 millimeters and that of the palm 16 millimeters. The toothing of the fingers agrees well with Coutière's description and figures. At the proximal end of the immobile finger close to the articulation of the mobile finger with the palm are 4 rather indefinite teeth on a short ridge, which is a continuation of the cutting edge. Following this is a short space along the cutting edge which is without teeth. At the end of the space is a well-developed obtuse tooth, beyond which a distinct keel is seen extending to the tip of the finger. Along the inner side of this keel, but not arising from it, is a series of 16 anteriorly directed, acute teeth which are placed at somewhat regular intervals. On the outer side of the keel is another series of 14 teeth similar to the one just mentioned, but the teeth have their origin from the side of the keel. At the proximal end of the mobile finger are 3 blunt teeth, the posterior 2 of which meet the short raised ridge of the immobile finger. The mobile finger extends beyond the immobile finger.

The oval palm, which is much wider than the carpus, measures 16.5 millimeters in length, 10.5 millimeters in width, and 6 millimeters in thickness. The carpus (17 millimeters) is slightly

longer than the palm, and is much reduced in diameter at its posterior end. The merus equals the carpus in length, while the ischium measures 8.5 millimeters.

A "linear space" is seen along the outer surface of the merus, carpus, and palm. The spines on the posterior, outer region of the palm are scalelike and oval in shape, and each spine is rather closely applied to the palm. Toward the anterior end of the palm the spines become more pointed, and on the fingers they curve at the tip, their upper surfaces being decidedly concave and their lower surfaces convex. On the superior border of the palm (the border continuous with the immobile finger) are 2 rows of stout conical spines, and these spines are longer than any of the others. Similar shorter spines are distributed sparsely over the inferior inner surface of the palm, and these, toward the superior region, grade into spines like those of the outer surface of the palm. Smaller spines of similar shape and distribution to those of the palm are found on the carpus, merus, and ischium.

The smaller cheliped (right) has slender widely gaping fingers, the mobile one of which measures 15.5 millimeters in length. Along the cutting edge of each finger is a dense growth of stiff hairs, but no teeth, tubercles, or keel can be seen.

The short oval palm measures 7 millimeters in length, 6 millimeters in width, and 4 millimeters in thickness. The carpus is not so wide (5 millimeters) as the palm, but is somewhat longer (9 millimeters). The merus (11 millimeters) is considerably longer than the carpus, and the ischium measures 6 millimeters.

The spines are much smaller than those of the larger cheliped, but they have a similar shape and distribution. "Linear spaces" are present. Patches of spines, which are characteristic of supposedly mature individuals in many species of palaemons and which are found on the carapace and abdomen, are not present in our two specimens.

In each specimen the tip of the telson is truncated, but this is probably the result of wear. The internolateral spines extend beyond the tip of the telson, a condition which is undoubtedly true of uninjured specimens. As usual, the externolateral spines are short. The inner ramus of the uropods extends posteriorly slightly farther than the outer ramus.

The third, fourth, and fifth legs are rather stout as compared with most other species of palaemons. The fifth leg is the shortest and the slenderest, although there is but little difference between the three. One-half of the propodus of the third leg

and the tip of the dactylus of the fourth leg extend beyond the tip of the antennal scale, but the fifth leg barely reaches it. The propodus of the fifth leg measures 7 millimeters in length, and at its middle point it is 1 millimeter in thickness.

Both specimens are males; they were collected in a small mountain stream near Sisiman, Bataan Province, Luzon, by Tomas Banguis.

*Palaemon latidactylus* Thallwitz. Plate III, figs. 10 and 10a-h.

This species is represented in our collection by 2 young mature male specimens (Nos. 1087 and 1484)<sup>46</sup> from the region of Manila, which agree very well with Thallwitz's<sup>47</sup> original description and with the description of de Man.<sup>48</sup> There are also 2 male specimens (Nos. 73 and 128), collected in the region of Manila, which I believe belong to the same species but which I consider to be "mâles féminisés;" 2 females (Nos. 371 and 593) from the Manila water supply; 1 male (No. 1485) from the Manila water supply, which I hesitate to include under this species; 2 specimens (Nos. 1499 and 1500), one of which is an old male and the other a young male from Jaro, Leyte; 3 specimens (No. 1451) from Agusan River, Mindanao; and a young mature male (No. 71) from Samar, which differs only slightly from Thallwitz's original description.

I believe, as do Thallwitz and de Man, that the specimens from Manila diagnosed by von Martens<sup>49</sup> as *Palaemon grandimanus* Randall are probably identical with *Palaemon latidactylus* Thallwitz. On the other hand, it is very questionable if von Martens's Manila specimens belong to Randall's *Palaemon grandimanus*. Miss Rathbun's notes on Randall's type specimens and her photographic reproduction of an old male from the Honolulu market indicate that von Martens's Manila specimens belong to a different species.<sup>50</sup> The following description applies to an old male (No. 1484) collected from the settling basin of the Manila water supply:

It is 66 millimeters in length (carapace 20.5 millimeters), and the rostrum extends to the tip of the peduncle of the first antenna. There are 16 teeth on the dorsal border of the rostrum,

<sup>46</sup> In this description the numbers referred to are museum numbers.

<sup>47</sup> Abhandlungen und Berichte des Königlichen Museums zu Dresden (1891), 17.

<sup>48</sup> Abh. Senckenbergischen Naturforsch. Ges. (1900), 25, 802.

<sup>49</sup> Arch. f. Naturgesch. (1868), 34, 45.

<sup>50</sup> Bull. U. S. Fish Comm. (1903), 23, pt. 3, 923. Published in 1906.

of which 4 are situated on the carapace. The first and second teeth, and in some other specimens also the second and third, are more widely separated from one another than the rest. Anteriorly the dorsal border dips, but there is scarcely any convexity over the eye. On the lower border are 3 teeth, sometimes 4 in other specimens, and the tip of the rostrum does not turn upward. The posterior part of the lateral ridge on the rostrum should be shown slightly higher up than it is in the figure (Plate III, fig. 8). One-sixth of the carpus of the first pair of legs extends beyond the antennal scale, and the outer maxillipeds reach slightly beyond the peduncle of the second antenna.

The chelipeds are decidedly unlike in form and unequal in length, the larger being much longer than the body. One-sixth of the merus of the larger and one-third of the carpus of the smaller cheliped extend beyond the antennal scale. Measuring in a straight line from the articulation of the mobile finger (large cheliped) to the tip of the same, the length is 20 millimeters. This finger is strongly curved inward, it is compressed laterally throughout its extent, and crosses the tip of the immobile finger when the fingers are closed. Near the proximal end of the mobile finger, along the cutting edge, are 3 small, closely set teeth, which are followed distally by 2 somewhat larger teeth. Beyond these, 5 teeth are seen which gradually decrease in size, until near the tip the last one is nothing more than an inconspicuous tubercle. The immobile finger is strongly compressed laterally, its outer surface is decidedly concave near the palm, and its proximal end is much wider than that of the mobile finger, about 2:1. Near the proximal end of the cutting edge is a comparatively large tooth, which curves inward ending in an acute tip. This is followed by 7 smaller teeth, which become almost like tubercles near the tip of the finger. A few scattered hairs may be seen on both fingers, but at the proximal end of the mobile finger and on its lower surface there is a small dense patch of hairs.

The palm, which is strongly compressed, measures 30 millimeters in length, 12.5 millimeters in width at its widest point, and 6.5 millimeters in thickness in the same region. From these figures it will be seen that the palm is one and one-half times as long as the finger and that the ratio of the thickness of the palm to the greatest width is about 1:2.

The carpus, which is practically cylindrical in cross section and much narrower than the palm at its distal end, measures 25.5 millimeters in length, thus being shorter than the palm.

The merus varies in the shape of its cross section at different points, and measures 19 millimeters in length. It is much longer than the greatly compressed ischium, which is only 7.5 millimeters along its longest border.

There is a considerable growth of hair on the ventral edge of the palm and ischium. A few hairs are found near the ends of the carpus and merus, but for the most part the palm, carpus, merus, and ischium are without hairs. Closely set sharp spines are present on the inferior and lateral surfaces of the proximal end of the mobile finger, but the remainder of the finger is smooth. Similar closely set spines are present on the inferior border of the palm. These grade into much smaller and more widely separated teeth on the inner surface and, on the outer surface, into widely separated, very minute spines. A few rather heavy spines are located along the outer surface of the anterior border of the palm, where the mobile finger articulates. The spines on the carpus are widely separated, and on the inner surface they are fairly well developed. There are practically no spines on the upper and outer surfaces of the merus and ischium, but on the lower and inner surfaces they are very close set and well developed.

"Linear spaces" cannot be seen, but a longitudinal depression on the outer and inner surfaces of the palm along a line connecting the articulation of the mobile finger with the proximal end of the palm is very conspicuous.

The smaller cheliped (left) has slender, widely gaping fingers; the mobile one measures 12 millimeters in length, and the immobile one is slightly shorter. Along the cutting edge of both fingers is a dense growth of stiff hairs and a well-developed keel. Near the proximal end of the immobile finger is a short portion of the cutting edge, which shows indication of breaking up into 3 or 4 teeth. This is followed distally by a short space at the end of which is a small tooth, but beyond the latter no teeth nor tubercles can be seen. Three small teeth are visible at the proximal end of the mobile finger. The short oval palm measures 7.5 millimeters in length, 4.5 millimeters in width, and 3.1 millimeters in thickness. The carpus is not so wide (4 millimeters) as the palm, but it is considerably longer (10 millimeters). The merus (9.5 millimeters) is slightly shorter than the carpus, and the ischium measures only 6 millimeters in length.

Unlike the larger cheliped, the fingers, palm, and carpus are free from spines, but the lower surface of the merus and ischium are armed with a few spines similar to those on the large cheliped, but smaller. Patches of small spines are present on the anterior

part of the carapace in the dorsal and lateral regions, but they are not present on the abdomen nor on its appendages.

The telson ends in an acute spine; the externolateral spines do not extend so far posteriorly as the tip of the telson, but the internolateral spines overreach it by one-half of their length. The 2 rami of the uropods extend the same distance posteriorly.

Some of the walking legs of this specimen are missing, but in the other old male (No. 1087) they are intact. In the case of No. 1087, the third, fourth, and fifth legs are of equal length but slenderer than those of *Palaemon lepidactylus*. The third leg just reaches the tip of the antennal scale. One-fifth of the propodus of the fourth leg and the dactylus of the fifth leg extend beyond the peduncle of the second antenna. The propodus of the fifth leg measures 8.75 millimeters in length, and at its middle point it is 0.5 millimeter in diameter.

The old male, No. 1484, which has been described in detail above, was collected in the settling basin of the Manila water supply by A. L. Day; the old male, No. 1087, was collected by Alvin Seale from Laguna de Bay, near Manila, Luzon.

Two other male specimens, Nos. 128 and 73, collected in the region of Manila, differ in the size of the body and the form of the large cheliped from the individual described above. These specimens have a somewhat greater body length, the gape between the fingers of the chela is less, the mobile finger is not curved so sharply, the width of the immobile finger at the proximal end (Plate III, figs. 10c and 10d for No. 128 and No. 73, respectively) is not so great, and there is a more extensive armature of spines on the outer surface of the palm. I consider these specimens, although they are larger than the young mature males, to be "mâles fémenisés" or at least specimens in which the mature male form of the chela has not yet developed. Unlike No. 1484, the patches of spines on the carapace are feebly developed, a condition which indicates immaturity.

The 3 specimens (No. 1451) from Mindanao are very similar to the young mature male. They have about the same body length (one specimen is a little smaller), and the large chela (Plate III, fig. 10e, No. 1451x) is still well armed with spines on the outer surface, but it is approaching more nearly the shape and proportions of the mature male form. The specimen (No. 71) from Samar is smaller than the specimens from Mindanao, but the large chela has taken on the mature form and proportions. I consider it to be a young mature male.

One of the specimens from Leyte (No. 1500) measures 86.5 millimeters in length (carapace, 27 millimeters). It is an old

mature male and the largest one in the collection. Unfortunately, the fingers on the large cheliped are broken. The palm measures 35 millimeters in length, 15 millimeters in width, and 8 millimeters in thickness, indicating that with increasing age the palm becomes wider in proportion to the length (1 : 2.33) and thicker in proportion to the width (1:1.80). The patches of spines on the carapace are better developed than in any of the rest of our specimens, but as in the latter they are absent from the abdomen. The superior portion of the outer surface of the palm is absolutely smooth.

The other specimen from Leyte (No. 1499) is of interest because it is a very young male, possibly a "mâle féminisés." Anteriorly, the rostrum dips only slightly, and there are no patches of spines on the carapace or abdomen. The large chela is similar in shape to that of specimen 128, but it is smaller. The palm is well covered with fine spines, and the gape between the fingers is small. There is no gape between the fingers of the small chela and no thick growth of hair. Furthermore, the slender fingers are only slightly longer than the narrow palm, which is no wider than the carpus.

The largest female, No. 593, measures 68 millimeters in body length, the carapace and abdomen are smooth, and the chelipeds are alike. There is no gape between the fingers which lack a thick growth of hair and no teeth on the distal two-thirds, but there is a well-developed keel on the cutting edge of the latter. The fingers are shorter than the palm, which is compressed and slightly wider than the carpus.

Finally, specimen 1485, an old male from the water supply of the city of Manila, is one which, owing to lack of material, I do not feel justified in classifying at the present time. It measures 91 millimeters in body length, dense patches of spines are present on the anterior part of the carapace, the abdomen is smooth, and the rostrum is practically like that of *Palaemon latidactylus*. The large cheliped in respect to the distribution of spines and the toothings of the fingers is like that of *Palaemon latidactylus*, but the shape of the chela is different. The fingers, which are only slightly shorter than the palm, gape considerably. The immobile finger is comparatively narrow at its proximal end, and the mobile finger is not curved sharply. In the case of the smaller cheliped, the palm has about the same width as the distal end of the carpus, the fingers gape only moderately, and the growth of hair on them is not so great as in specimen 1484. Further collections may justify the establishment of a new variety of *Palaemon latidactylus*. If the view of Henderson and

Matthai is correct concerning some species of *Macrobrachium*, this specimen may be a polymorphic form of *Palaemon latidactylus*.

Specimens 73, 128, and 371 were purchased in a Manila market by the author, and it is supposed that they were collected in Pasig River, near Manila; No. 593 was taken from the filter of the Bureau of Science, which receives its water from the Manila water supply; No. 1485 was collected by A. L. Day from the settling basin of the Manila water supply; Nos. 1499 and 1500 were collected by Alvin Seale and Urbano Villamor in a small river at Jaro, Leyte; the 3 specimens, No. 1451, were collected by E. H. Taylor in a natural canal connected with Agusan River, Mindanao.

*Palaemon* sp. Plate III, figs. 11 and 11a-c.

Two old male palaemons collected from the Manila water supply may be representatives of a new species, although the specimens possess certain characters which suggest *Palaemon esculentus* Thallwitz and especially *Palaemon oenone* de Man.<sup>51</sup> However, as I have not seen specimens of either of these species and as I have 2 specimens of nearly the same size only, I do not feel justified in describing them as a new species.

The description which follows, except when otherwise stated, applies to the largest individual whose body length is 59.5 millimeters and whose carapace length is 20 millimeters: The body length of the smaller specimen is 58 millimeters and the length of the carapace, 19 millimeters. The rostrum which curves down slightly, fails by a considerable distance to reach the tip of peduncle of the first antenna. Of the 15 almost evenly spaced teeth on the dorsal border of the rostrum, 7 are situated on the carapace, and of these the first 3 are smaller than those anterior to them. The first tooth is situated back of the orbit a little more than one-third of the distance from the orbit to the posterior border of the carapace. On the lower border of the rostrum are 2 teeth. From this description it is evident that the shape and dental formula of the rostrum and the arrangement, size, and position of the rostral teeth very closely resemble those of *Palaemon oenone* and not so closely those of *Palaemon esculentus*. The rostrum of the smaller specimen is similar to the description given above, but the dental formula is only  $\frac{14}{2}$  with the seventh tooth directly over the posterior edge of the orbit.

<sup>51</sup> *Abh. Senckenbergischen Naturforsch. Ges.* (1900), 25, 784.



One-half of the carpus of the first pair of legs extends beyond the antennal scale, and the distal segment of the outer maxillipeds extends beyond the peduncle of the second antenna.

The chelipeds are decidedly unlike in form and unequal in length, the larger being much longer than the body. One-third of the merus of the larger and two-thirds of the carpus of the smaller cheliped extend beyond the antennal scale. Measuring in a straight line from the articulation of the mobile finger (large cheliped) to the tip of the same, the length is 25.5 millimeters. This finger is strongly curved inward, it is slightly compressed near the tip, and it crosses the tip of the immobile finger when the fingers are closed. Near the proximal end of the mobile finger, along the cutting edge, are 5 low blunt teeth, followed distally by a space at the end of which there is a rather large subacute tooth. Beyond this, the cutting edge, which runs more and more toward the outer surface of the finger as the tip is approached, bears 14 low tubercles, which gradually decrease in height toward the distal end of the finger. The immobile finger, which is almost straight when seen in side view, curves inward slightly and, although compressed laterally, is not concave on its outer surface. It is one and one-half times as wide as the mobile finger at the proximal end. There is a conspicuous distally directed tooth on the cutting edge at the proximal end of the immobile finger, and between this tooth and the articulation of the mobile finger is a short low ridge, which possibly in older specimens may be broken up into small confluent teeth. Along the cutting edge, distal to the conspicuous tooth, 13 tubercles may be seen, which gradually decrease in size as the tip of the finger is approached. A few scattered hairs are present on both fingers, and the elongated, anastomosing, longitudinal grooves described by de Man as characteristic of *Palaemon oenone* can be seen easily with a low-power lens.

The palm, which is strongly compressed, measures 26 millimeters in length, 12 millimeters in width at its widest point, and 7 millimeters in thickness in the same region. From these figures it will be seen that the mobile finger (measured as described above) is almost equal in length to the palm and that the ratio of the thickness of the palm to the greatest width is about 1:1.71. The palm decreases suddenly in width near its proximal end where it is clothed, especially on its superior and inferior borders, by a thick feltlike growth of hairs. On the rest of the palm no hairs can be seen.

The short, much inflated carpus, which is cylindrical in cross section and much smaller in diameter than the width of the distal

two-thirds of the palm, measures 15.5 millimeters in length, thus being a little more than one-half as long as the palm. There is a fairly thick coating of long hairs over the entire carpus.

The shape of a cross section through the merus differs at different points. When seen from above, the outer border is almost straight and the inner border forms a line shaped like an elongated S. The merus, which is covered with a thick coating of long hairs on its inferior, inner, and superior surfaces, measures 18 millimeters in length, and is much longer than the greatly compressed ischium. The latter is only 7 millimeters in length along its longest border.

Anteriorly directed, closely set, flattened spines which give only a sensation of slight roughness when the finger is rubbed over them are present upon the inferior border of the palm. On the inner and outer lateral regions and the superior border these are even smaller in size. These spines extend about halfway out on the fingers, but beyond this the latter are smooth so far as spines are concerned. Spines similar to those of the palm are present on the carpus, merus, and ischium, but they are better developed, and on the inner surfaces of these members they are comparatively long and sharply pointed. No "linear spaces" can be detected.

The large cheliped of the smaller specimen differs mainly from that of the longer specimens in the shape and size of the fingers and in the proportion of the width of the palm to its length. The mobile finger is much less strongly curved, and the palm is narrower in proportion to its length.

The smaller cheliped (left) of the large specimen has widely gaping fingers; the mobile one measures 15.5 millimeters in length, and the immobile one is slightly shorter. Along the cutting edge of both fingers is a dense growth of stiff hairs and a slightly developed keel. Near the proximal end of the mobile finger are 5 low blunt teeth followed by a short space, at the end of which there is a larger and more acute tooth; beyond this no tubercles or teeth can be seen. At the proximal end of the immobile finger is a short ridge on the cutting edge, reminding one of a similar structure on the large cheliped; in the former, however, it shows indication of breaking up into small teeth. Beyond this ridge and very close to it is a large anteriorly directed tooth similar in shape to the one on the immobile finger of the large cheliped. As in the case of the mobile finger, there are no tubercles or teeth beyond the large tooth just mentioned. The palm measures 10.5 millimeters in length, 5 millimeters in width, and 4 millimeters in thickness. The carpus is not so

wide (4 millimeters) as, and is considerably shorter (8.5 millimeters) than, the palm. The merus (9.5 millimeters) is slightly longer than the carpus, and the ischium measures 6 millimeters in length.

The fingers are smooth, the palm is armed with a few minute spines, and the carpus, merus, and ischium have fairly well-developed spines on their inner and lower surfaces. Along the inner surfaces of the carpus, merus, and ischium is a considerable growth of rather long hairs, and on the superior and inner surfaces of the posterior end of the palm is a patch of felted hairs similar to that on the large cheliped. The small cheliped of the smaller specimen is essentially like that of the large specimen, except that it is smaller, that the palm is relatively shorter, and that the patch of felted hair is absent.

The telson of the large specimen ends rather bluntly, a condition which is undoubtedly the result of wear; the externolateral spines are very short, and the internolateral spines extend beyond the telson tip for a considerable distance. The outer and inner rami of the uropods are of equal length.

Patches of small spines are present on the anterior part of the carapace in the dorsal and lateral regions, but are not present on the abdomen or its appendages.

The third legs are slightly longer than the fourth, and the latter are slightly longer than the fifth. They are all slenderer than those of *Palaemon lepidactylus* and they are about the same size as those of *Palaemon latidactylus*. One-fifth of the propodus of the third leg and the tip of the dactylus of the fourth leg extend beyond the antennal scale, but the fifth leg extends with the dactylus only beyond the peduncle of the second antenna. The propodus of the fifth leg measures 8 millimeters in length, and at its middle point it is 1.0 millimeter in diameter. Both specimens were collected by R. C. McGregor from the filter of the Bureau of Science, which receives its water from the Manila city water supply.

## ILLUSTRATIONS

(All the illustrations are of natural size unless otherwise stated. Drawings by José K. Santos.)

### PLATE I

FIG. 1. *Palaemon carcinus* Fabricius. Old male, 320 millimeters long.

- 1<sup>a</sup>. Left cheliped of same specimen.
- 1<sup>b</sup>. Telson of female, 116 millimeters long.  $\times 6$ .
- 1<sup>c</sup>. Middle-aged male, 245 to 250 millimeters long.
- 1<sup>d</sup>. Full-grown female, 248 millimeters long.
- 1<sup>e</sup>. Left cheliped of young male, probably mature, 240 millimeters long.
- 1<sup>f</sup>. Left cheliped, full-grown female shown in fig. 1<sup>d</sup>.
- 1<sup>g</sup>. Young female, 115 millimeters long.
- 1<sup>h</sup>. Right cheliped of same specimen.
- 1<sup>i</sup>. Young male, 100 millimeters long.
- 1<sup>j</sup>. Right cheliped of same specimen.

### PLATE II

FIG. 2. *Palaemon philippinensis* sp. nov. Old male, 144 millimeters long. No. 31.

- 2<sup>a</sup>. Left cheliped of same specimen.
  - 2<sup>b</sup>. Mobile finger of same, showing outer surface and cutting edge.  $\times 2$ .
  - 2<sup>c</sup>. Immobile finger of same left cheliped, showing outer surface and cutting edge.  $\times 2$ .
  - 2<sup>d</sup>. "Mâle féminisé," 114 millimeters long. No. 19.
  - 2<sup>e</sup>. Left cheliped of same.
  - 2<sup>f</sup>. Immobile finger of same.  $\times 3$ .
  - 2<sup>g</sup>. Mobile finger of same.  $\times 2.5$ .
  - 2<sup>h</sup>. Left cheliped of young mature male, 111.5 millimeters long. No. 13. Measurements given in Table II apply to right cheliped.
  - 2<sup>i</sup>. Young male, 39.5 millimeters long. No. 1 (a).  $\times 2$ .
  - 2<sup>j</sup>. Right cheliped of same.  $\times 2$ .
  - 2<sup>k</sup>. Tip of telson of male, 117 millimeters long.  $\times 10$ .
  - 2<sup>l</sup>. Tip of telson of young female, 47 millimeters long.  $\times 34$ .
  - 2<sup>m</sup>. Pigment marks on the carapace of *Palaemon philippinensis* sp. nov.
3. *Palaemon sundaicus* Heller. Young mature male, 90 millimeters long. No. 15.
- 3<sup>a</sup>. Left cheliped of the same, markings faded after preservation.
  - 3<sup>b</sup>. Female, 79 millimeters long. No. 36.
  - 3<sup>c</sup>. Left cheliped of same, showing markings.
  - 3<sup>d</sup>. Young male, 66.5 millimeters long. No. 2.
  - 3<sup>e</sup>. Left cheliped of same, showing markings.
  - 3<sup>f</sup>. Tip of telson of young male. No. 7.

FIG. 4. *Palaemon lanceifrons* Dana. Mature male, 62.5 millimeters long. No. 6.

- 4<sup>a</sup>. Right cheliped of same.
- 5. *Palaemon lanceifrons* Dana (local form). Mature male, 63.5 millimeters long. No. 7.
  - 5<sup>a</sup>. Left cheliped of same.
  - 5<sup>b</sup>. Right cheliped of same.
  - 5<sup>c</sup>. Mobile finger of left cheliped (fig. 5<sup>a</sup>), inner aspect.  $\times 3$ .
  - 5<sup>d</sup>. Immobile finger of same, inner aspect.  $\times 3$ .
  - 5<sup>e</sup>. Young male, 49 millimeters long. No. 1.
  - 5<sup>f</sup>. Right cheliped of same.
  - 5<sup>g</sup>. Pigment marks on carapace of *Palaemon lanceifrons* Dana, the local form and *Palaemon lanceifrons* Dana var. *montalbanensis* var. nov.  $\times 2$ .
- 6. *Palaemon lanceifrons* Dana var. *montalbanensis* var. nov. Old male, 65.5 millimeters long. No. 12.
  - 6<sup>a</sup>. Right cheliped of same.
  - 6<sup>b</sup>. Left cheliped of same.
  - 6<sup>c</sup>. Immobile finger of left cheliped, inner aspect.  $\times 3$ .
  - 6<sup>d</sup>. Mobile finger of same, inner aspect.  $\times 3$ .
  - 6<sup>e</sup>. Female, 45.5 millimeters long, with eggs.
  - 6<sup>f</sup>. Cheliped of same.
  - 6<sup>g</sup>. Young male, 51 millimeters long. No. 3.
  - 6<sup>h</sup>. Cheliped of same.
  - 6<sup>i</sup>. Tip of telson of young male, 43 millimeters long.  $\times 16$ .
- 7. *Palaemon lar* Fabricus. Old male, 114 millimeters long. No. 10.
  - 7<sup>a</sup>. Right cheliped of same, inner aspect.
  - 7<sup>b</sup>. Left cheliped of same, outer aspect.
  - 7<sup>c</sup>. Young male.
  - 7<sup>d</sup>. Left cheliped of same.
  - 7<sup>e</sup>. Chela of specimen of about the same size as the one shown in fig. 7<sup>c</sup>.  $\times 3$ .
  - 7<sup>f</sup>. Young male.
  - 7<sup>g</sup>. Left cheliped of same.
  - 7<sup>h</sup>. Tip of telson of young male.  $\times 8$ .

#### PLATE III

FIG. 8. *Palaemon jaroensis* sp. nov. Old male, 72 millimeters long. No. 6.

- 8<sup>a</sup>. Right cheliped of same, outer aspect.
- 8<sup>b</sup>. Left cheliped of same, outer aspect.
- 8<sup>c</sup>. Outline of chela of left cheliped, hair removed.
- 8<sup>d</sup>. Mobile finger of left cheliped.  $\times 2$ .
- 8<sup>e</sup>. Immobile finger of same.  $\times 2$ .
- 8<sup>f</sup>. Mobile finger of right cheliped.  $\times 2$ .
- 8<sup>g</sup>. Immobile finger of same.  $\times 2$ .
- 8<sup>h</sup>. Spines on palm of No. 6.  $\times 2$ .
- 8<sup>i</sup>. Spines on finger of No. 6.  $\times 2$ .
- 8<sup>j</sup>. Right cheliped of female. No. 7.
- 8<sup>k</sup>. Left cheliped of same.
- 9. *Palaemon lepidactylus* Hilgendorf. Old male, 58.5 millimeters long.
  - 9<sup>a</sup>. Left cheliped of same, outer aspect. Carpus shown drawn away from palm and hence longer than stated in text.
  - 9<sup>b</sup>. Right cheliped of same, outer aspect.

FIG. 10. *Palaemon latidactylus* Thallwitz. Old male, 66 millimeters long. Museum No. 1484.

10<sup>a</sup>. Right cheliped of same, outer aspect.

10<sup>b</sup>. Left cheliped of same, outer aspect.

10<sup>c</sup>. Large chela of specimen. Museum No. 128.

10<sup>d</sup>. Large cheliped of specimen. Museum No. 73.

10<sup>e</sup>. Chela of specimen. Museum No. 1451x.

10<sup>f</sup>. Old male, 91 millimeters long. Species? Museum No. 1485.

10<sup>g</sup>. Right cheliped of same, outer aspect.

10<sup>h</sup>. Left cheliped of same, outer aspect.

11. *Palaemon* sp. Old male, 59.5 millimeters long. Museum No. 572.

11<sup>a</sup>. Right cheliped of same, outer aspect.

11<sup>b</sup>. Left cheliped of same, inner aspect.

11<sup>c</sup>. Right cheliped of specimen, 58 millimeters long. Museum No. 572.

TEXT FIGURE

FIG. 1. Diagram of a palaemon.



# **Oversized Foldout**



# **Oversized Foldout**

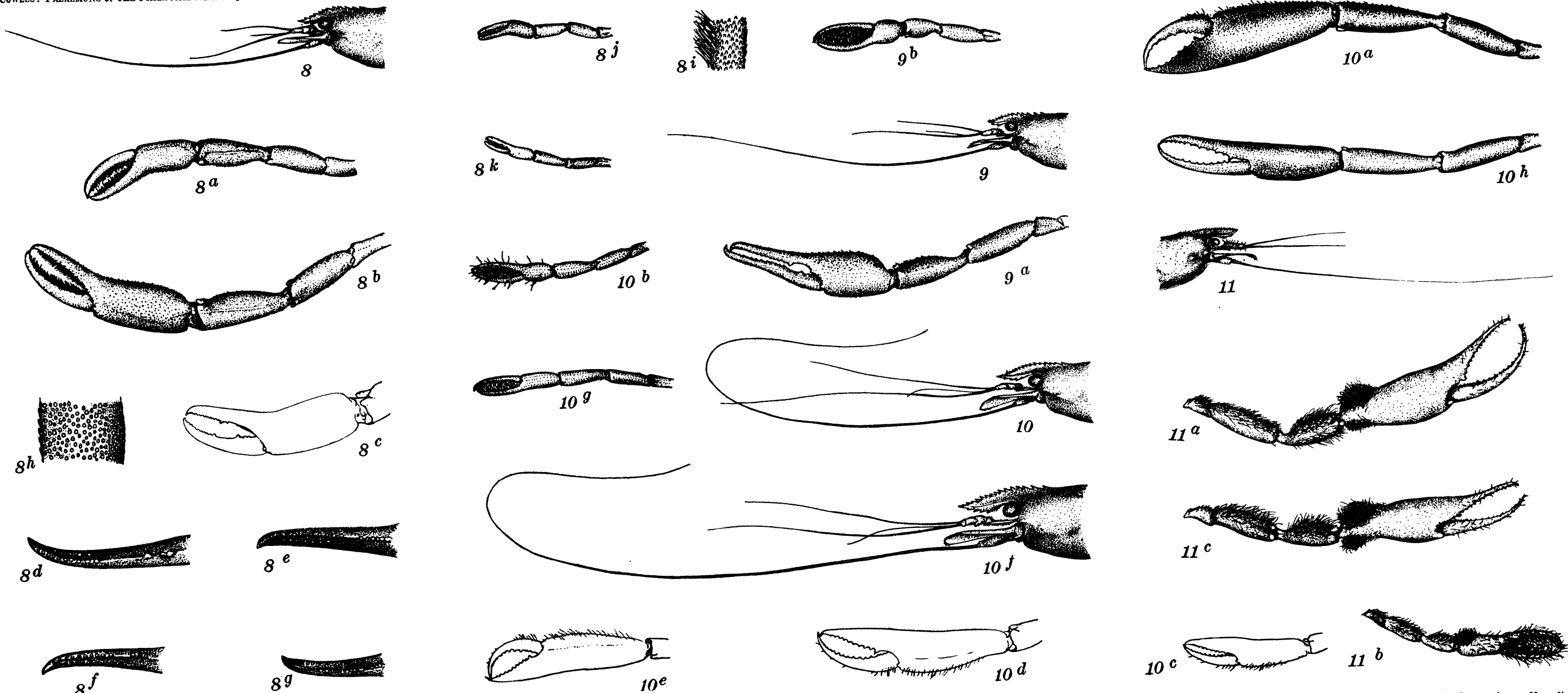


Fig. 8. *Palaemon jaroensis* sp. nov. Old male 72.0 mm. long. No. 6.

Fig. 8a. Right cheliped of same. Outer aspect.  
 Fig. 8b. Left cheliped of same. Outer aspect.  
 Fig. 8c. Outline of chela of left cheliped, hair removed.  
 Fig. 8d. Mobile finger of left cheliped.  $\times 2$ .  
 Fig. 8e. Immobile finger of same.  $\times 2$ .

Fig. 8f. Mobile finger of right cheliped.  $\times 2$ .

Fig. 8g. Immobile finger of same.  $\times 2$ .  
 Fig. 8h. Spines on palm of No. 6.  $\times 2$ .  
 Fig. 8i. Spines on finger of No. 6.  $\times 2$ .  
 Fig. 8j. Right cheliped of female. No. 7.  
 Fig. 8k. Left cheliped of same.

Fig. 9. *Palaemon lepidactylus*. Old male 58.5 mm. long.

Fig. 9a. Left cheliped of same. Outer aspect. Carpus shown drawn away from palm and hence longer than stated in text.

Fig. 9b. Right cheliped of same. Outer aspect.  
 Fig. 10. *Palaemon latidactylus*. Old male 66.0 mm. long. Mus. No. 1484.

Fig. 10a. Right cheliped of same. Outer aspect.

Fig. 10b. Left cheliped of same. Outer aspect.  
 Fig. 10c. Large chela of specimen Mus. No. 128.  
 Fig. 10d. Large chela of specimen Mus. No. 73.  
 Fig. 10e. Chela of specimen Mus. 1451 ( $\times$ ).  
 Fig. 10f. Old male 91.0 mm. long. Species? Mus. No. 1485.  
 Fig. 10g. Right cheliped of same. Outer aspect.  
 Fig. 10h. Left cheliped of same. Outer aspect.

Fig. 11. *Palaemon* sp.? Old male 59.5 mm. long. Mus. No. 572.

Fig. 11a. Right cheliped of same. Outer aspect.  
 Fig. 11b. Left cheliped of same. Inner aspect.  
 Fig. 11c. Right cheliped of specimen 58.0 mm. long. Mus. No. 572.



## A NEW PHILIPPINE MALARIA MOSQUITO

By CHARLES S. BANKS

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Manila, P. I.)

In the course of investigations at Calamba, Laguna Province, Luzon, carried on by Drs. E. L. Walker and M. A. Barber to ascertain the species of mosquitoes capable of transmitting malaria, many specimens of a very interesting *Myzomyia* were bred between December 27, 1913, and April 12, 1914.

This mosquito, in many respects, is very much like *Myzomyia funesta* Giles and *M. rossii* Giles, but differs in the wing spots and female palpal markings.

A brief description of this mosquito is given by Doctors Walker and Barber<sup>1</sup> and this more detailed description is given fully to identify the species.

*Myzomyia febrifera* sp. nov. ♂ and ♀.

General color pale gray, thorax darker laterally, abdomen dark, proboscis dark brown, labellæ golden brown, apical third of palpi of female white with dark brown markings, as described below. Wings with 4 broad black costal spots alternating with cream spots, other veins with alternately black and cream scales. Legs wholly brown or bluish brown, with exceedingly minute golden brown spots or rings at articulations.

*Male*.—Pale gray, head with erect black scales on occiput, white ones on frons, and a bifurcated tuft of white hairs between eyes; antennæ golden brown-gray, apical segment inflated; palpi porrect, basal segments thin, dark brown, apical one white with brown transverse and semilongitudinal bands which are preapical and basal; apical segment with pale bristles on interior surface; proboscis dark brown; labellæ pale.

Mesonotum pale gray with a dark brown median hair-line expanding caudad before scutellum, also faint submedian and dorsolateral lines caudad. Pleuræ pale with indistinct, longitudinal brown fasciæ, golden hairs abundant on dorsum and sides. Scutellum dark mediad; metanotum dark, narrow median fascia.

<sup>1</sup> *This Journal*, Sec. B (1914), 9, 384.

Abdomen dark unctuous brown with golden hairs equal in length to width of segments. Genitalia ordinary, claspers sub-falcate-spatulate apically.

Legs uniformly dark brown, except coxæ which are pale; all articulations marked by indistinct golden brown spots or rings.

Wings pale cream with dark areas as follows: Basal third of costa brown (1),<sup>2</sup> then a short cream area (2), then a long brown area (3), one-fifth length of wing a pale area one-half as long (4), a brown area equal to this (5), another pale area equal to this (6), a brown area two-thirds as long as this (7), and an apical pale area (8). Subcosta with brown area below apical half of (1) and one also below (3). First longitudinal vein with brown area like (1) on subcosta, but its next dark area (3) is interrupted just after its beginning by a pale area equal to (2) in length, followed by brown area two-thirds the length of (3); the remaining apical markings of this vein are like (4), (5), (6), (7), and (8) on costa. First submarginal cell twice the length of the second posterior, its forks brown, their junction pale, the stem brown, interrupted by pale areas at cross veins. Third vein pale with 2 dark spots at cross veins and 1 at apex. Fourth longitudinal vein with pale basal third, then dark to cross veins, at which it is pale, and beyond which dark nearly to junction of forks which is pale; beyond this point, both forks are dark to apices which are pale. Fifth vein pale with a small dark subbasal spot and a spot at forks, the anterior of which has 1 long and 1 short basal dark spot and a similar preapical one; basal three-eighths of posterior fork pale, the apical five-eighths dark. Sixth vein with basal one-fourth pale, then a short dark line, a short pale line, and the apical one-half dark. Marginal fringe dark brown, with pale areas at all veins except sixth.

*Female*.—Color of head, body, legs, and wings similar to that of male, but wings much darker and more distinctly marked. White frontal tufts extended to middle of clypeus; proboscis as in male but darker; palpi somewhat similar to those of *M. rossii* Giles, but apical third cream-white with an ill-defined wide brown ring near its middle, or subbasal in some specimens; middle and basal thirds of palpus separated by a narrow snowy ring; basal scales erect. Antennæ dark brown with golden gray verticils.

<sup>2</sup> (1), (2), etc., refer to numeration of costal areas and correlate these with areas on other veins of wing.

Length, exclusive of proboscis: ♂, 3.5 millimeters; ♀, 3 millimeters; length of wing, 2.75.

LUZON, Laguna Province, Canlubang near Calamba (*E. L. Walker and M. A. Barber*).

Type ♂ and ♀, No. 18015, in entomological collection, Bureau of Science, Manila. Paratypes bear the same number.

Time of rearing, April 2, 1914.

This species has been proved to be a malaria carrier, hence its name.









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## STUDIES IN PHILIPPINE JASSOIDEA: I, SOME REMARKABLE TETTIGONIELLIDÆ

By C. F. BAKER

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Los Baños, P. I.*)

Eleven text figures

It did not take long for Julian Valdez, after coming to these Islands two years ago, to bring together specimens of all of the Tettigoniellidæ previously recorded from the Islands, and that from a very circumscribed region near Los Baños, Laguna Province, Luzon. At the same time he discovered many more not yet in the Philippine list. Among the latter I find some very remarkable insects—a few belonging to genera or species described by Distant.<sup>1</sup>

One group of species in this new material represents a generic type apparently undescribed by Distant, Kirkaldy, Melichar, or Matsumura, and this group adds to the Philippine fauna not only a new genus, but a subfamily not previously known to occur so far east. The species of this genus are found, so far as known to me, only in the forests on the neighboring mountain masses of Maquiling and Banahao, and for this reason I am giving them the generic name *Makilingia*.

Genus **MAKILINGIA** novum

Small tettigoniellids, colored principally black and red, rarely whitish, with head much narrower than pronotum, anterior margin very shortly sublunate and strongly rounded in front between the eyes. Face rather long and narrow. Basal clypeal suture usually entirely obsolete. Loræ small and narrow. Lat-

<sup>1</sup> Fauna Brit. India—Rhynchota.

eral frontal margins passing close to eyes. Vertex flattish or concave, variously impressed or excavated, and always longer than half width between eyes. Ocelli placed before the line of anterior margins of eyes. Pronotum longer than the vertex, of a sexangular type in form, but anteriorly strongly, quite evenly, and narrowly rounded from the lateral angles to between the eyes, the posterior lateral margins short, the posterior margin gently incurved, the pleural area with a strong complete carina. Scutellum usually large, longer than wide or wider than long, and with an acuminate tip, the posterior area more or less swollen. Tegmina normal in outline or somewhat narrowed distad, with 4 apical cells and 2 or 3 anteapicals, sometimes with indistinct and irregular cross-veins in the costal area; clavus without cross-veins, its 2 sectors joining the commissure; appendix very short or extending to near tip of inner apical cell. Armature of hind tibiae dense and heavy. Sculpturation largely a heavy and conspicuous puncturation.

Type: *Makilingia nigra* sp. nov.

By reason of the very distinctive form of pronotum and head, the strong sculpturation and coriaceous tegmina this genus unquestionably finds its nearest relatives among the Hylicinae—a group very highly developed in India. Of the described hylicine genera it approaches most nearly to *Bhooria*. Viewed from above, the remarkable character of the head is not apparent, but a side view instantly removes it from any near relationship with *Tettigoniella*.

The species of this group are undoubtedly congeneric. They all conform closely to the generic type in habitus and all fundamental characters. Within the group, however, are remarkable divergences in structural detail. It would be easy to break the genus into three or four groups equivalent to many of Distant's or Kirkaldy's "genera," although in well-founded taxonomy I do not see how they could be more than subgenera.

*Synopsis of species of Makilingia.*

- $\alpha^1$ . Clypeus notched at tip, the basal suture distinct at least at sides, front more than twice longer than wide; black, more or less whitish or bluish pruinose, the vertex with two triangular yellow marginal spots; length 7 mm..... *M. pruinosa* sp. nov.
- $\alpha^2$ . Clypeus entire and rounded at tip, the basal suture obsolete; front much less than twice as long as wide.
- $\beta^1$ . Ocelli about as near eyes as to each other; ground color in large part black; scutellum wider than long.
- $\epsilon^1$ . Without red spots; deep black throughout, except the yellow legs and antennal scape; length 5–6 mm..... *M. nigra* sp. nov.
- $\epsilon^2$ . With red spots on vertex and elsewhere.

- d<sup>1</sup>. Deep black, four spots on margin of vertex, and a large elongate spot on claval commissure red or yellow; legs yellow; length 5-5.5 mm..... *M. maculata* sp. nov.
- d<sup>2</sup>. Vertex with four large coalescent spots about margin and three smaller spots basally; pronotum black; tegmina bronzy greenish with basal margin of clavus calloused red; legs reddish brown; length 5-5.5 mm..... *M. colorata* sp. nov.
- b<sup>1</sup>. Ocelli distinctly nearer to each other than to eyes; scutellum longer than wide; color very pale ochraceous with two small black marginal spots on vertex next eyes; tegmina milky white; length 5-5.5 mm..... *M. pallida* sp. nov.

***Makilingia nigra* sp. nov.**

Body and tegmina deep black, the legs and two basal antennal articles lemon yellow. Length ♂ 5, ♀ 6 mm.

Length of face twice the width between eyes; basal clypeal suture obsolete; front a little swollen and with disc flattened, transversely impressed above beneath margin of vertex; front coarsely sparsely punctate on disc, lateral margins and clypeus coarsely shagreened; loræ and genæ with very large confluent punctures. Length of vertex about five-sixths of the width between eyes, its anterior lateral margins slightly bisinuate; surface coarsely sparsely punctate, the entire

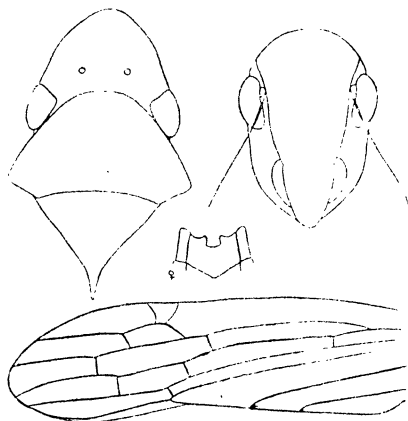


FIG. 1. *Makilingia nigra* sp. nov.

lateral areas between ocelli and eyes deeply excavated, as is also the anterior median area. Ocelli somewhat in front of anterior line of eyes, and about as far from each other as from eyes. Pronotum coarsely sparsely punctate, and posteriorly with indistinct transverse rugæ. Scutellum wider than long, longer than pronotum, transverse impressed line at middle very strong and medially widened; posterior to impressed line the surface is distinctly longitudinally striolate. Tegmina opaque, coriaceous proximad including the clavus, the entire coriaceous portion strongly sparsely punctate. Last ventral segment of female rectangularly emarginate, the lateral posterior borders strongly curved.

LUZON, Laguna Province, Mount Banahao (*Julian Valdez—coll. Baker*).

**Makilingia pruinosa** sp. nov.

Body and tegmina deep black; legs reddish brown, femora except tips black, 2 basal articles of antennæ yellowish. Narrow margin of head in front of eyes, and 2 large subtriangular spots near tip of vertex, yellowish; younger specimens entirely whitish or bluish pruinose above, this gradually disappearing in older specimens. Length ♀ 7 mm.

Length of face more than two and a half times the width between eyes, basal clypeal suture distinct at least at sides, the clypeus strongly notched at tip; face evenly convex, narrowly impressed below margin of vertex; front and genæ coarsely and confluent punctured, the clypeus and small area at base of

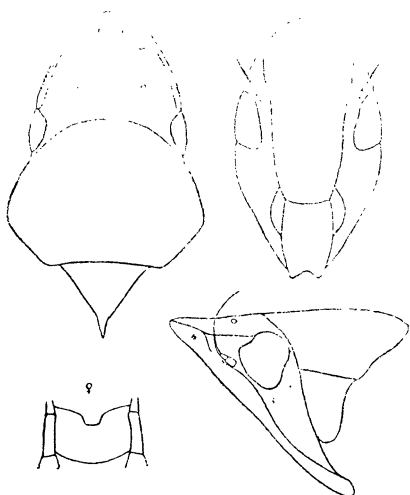


FIG. 2. *Makilingia pruinosa* sp. nov.

front coarsely shagreened, the front with indistinct transverse glabrous stripes at sides. Length of vertex a little more than three-fourths width between eyes, its disc coarsely sparsely punctate, a very fine carina very near to anterior margin and paralleling it; a large depression between each ocellus and the margin, and another medially situated, back of tip. Ocelli far in front of the line of anterior margins of eyes, and much nearer to eyes than to each other. Disc of pronotum strongly transversely

rugosopunctate, the lateral margins very slightly angled at hind margins of eyes (not shown in drawing). Scutellum wider than long, a little more than half length of pronotum, deeply broadly impressed near pronotum, the posterior portion swollen and finely rugose. Tegmina, except apically, coriaceous and strongly punctate, the veins strong, inner apical cell and appendix whitish translucent. Last ventral segment of female rectangularly emarginate, the lateral posterior borders straight.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

**Makilingia maculata** sp. nov.

Body and tegmina deep opaque black; the legs and basal antennal articles whitish or yellowish; front margin of head

with 4 equally spaced small bright red spots; clavus largely occupied by an irregular elongate commissural spot, broader anteriorly and constricted before the posterior end, either bright red or bright yellow; costal area with a large translucent spot slightly beyond line of tip of clavus. Length ♂ 5, ♀ 5.5 mm.

Length of face a little more than twice width between eyes; basal clypeal suture obsolete; front and clypeus evenly convex, coarsely but very uniformly shagreened throughout, scarcely at all impressed below margin of vertex; loræ and genæ coarsely sparsely punctate. Length of vertex about three-fourths of width between eyes; entire surface evenly shallowly concave. Ocelli just in front of line of anterior margin of eyes, and somewhat farther from each other than from eyes. Pronotum with disc coarsely shallowly irregularly punctate. Scutellum wider than long, nearly smooth anterior to the transverse median fine impressed line; back of this line greatly swollen to a posterior transverse ridge, the surface of this posterior area shining and minutely check striate. Tegmina opaque, coriaceous basally where it is sparsely punctate. Last ventral segment of female with the area of the emargination deep black, the emargination occupied by a large tooth, the lateral posterior margins straight; the last ventral segment of male is very large, strongly swollen, the hind margin medially acute, and the pygofers are distally strongly twisted, though this may not be normal.

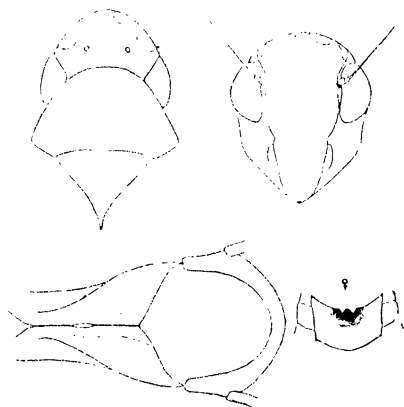


FIG. 8. *Makilingia maculata* sp. nov.

LUZON, Laguna Province, Mount Maquiling and Mount Banahao (*Julian Valdez—coll. Baker*).

*Makilingia colorata* sp. nov.

Head and pronotum shining black with a bronzy luster; legs reddish, femora yellowish; basal articles of antennæ yellow; face broadly banded above, this band reddish above at margin of vertex shading into yellow below, the lower margin of band sinuate. Vertex with 4 very large coalescent shining red spots on anterior margin, 2 small basal spots near eyes coalescent with these, and 1 small separated median basal spot. Basal half of

tegmina bronzy greenish, black punctate, remainder blackish translucent, the inner apical cell and appendix paler; inner basal borders of clavus shining calloused and reddish. Length ♂ 5, ♀ 5.5 mm.

Length of face nearly two and a half times width between eyes; basal clypeal suture obsolete; front and clypeus evenly convex, and evenly, thickly, strongly shagreened; loræ, genæ, and pronotal pleuræ below the carina, rugosopunctate. Length of vertex three-fourths of width between eyes; surface broadly concave; all of the red marginal areas shining calloused and nearly smooth or slightly striate; the dark disc thickly coarsely punctate; a longitudinal area outside of ocelli and reaching base

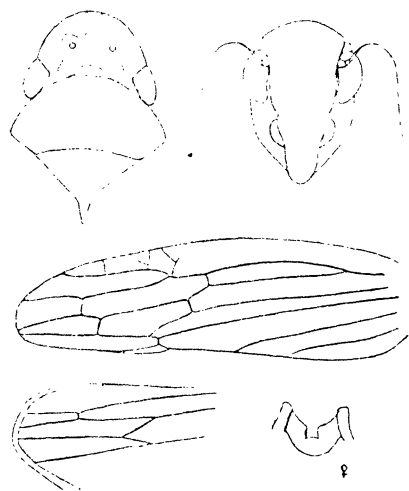


FIG. 4. *Makilingia colorata* sp. nov.

of vertex excavated; where this lateral depressed area reaches basal margin, the margin is cut through with a narrow sinus, a structure previously unknown in this family. Ocelli far in front of line of anterior margin of eyes, and farther from each other than from the eyes. Pronotum thickly and coarsely thimble-punctured. Scutellum much wider than long, about as long as pronotum, area anterior to the fine impressed transverse line coarsely thimble-punctured, behind this line slightly

swollen and finely rugose. Last ventral segment of female medially rectangularly marginate, the lateral posterior margins straight.

LUZON, Laguna Province, Mount Maquilang (*Julian Valdez—coll. Baker*).

***Makilingia pallida* sp. nov.**

Body pale ochraceous throughout; the tegmina milky white, apically narrowly margined with smoky; vertex with 2 small black spots on anterior margin next eyes and the ocelli black margined. Length ♂ 5, ♀ 5.5 mm.

Length of face a little more than twice width between eyes; basal clypeal suture obsolete; front and clypeus finely punctured, the former flattened on disc; loræ, genæ, and pronotal pleuræ below the carina rugosopunctate. Length of vertex about two-

thirds the width between eyes; sparsely coarsely punctured, the median and lateral areas depressed. Ocelli considerably in front of line of anterior margins of eyes, and much nearer to each other than to eyes. Pronotum coarsely and rather sparsely punctured. Scutellum longer than wide, with a transverse deeply excavated area next pronotum, the remainder swollen and rugoso-punctate. Tegmina with apical half

pearly translucent, the basal half coriaceous and sparsely strongly punctate. Last ventral segment of female emarginate, the emargination occupied by a black tooth, the whole area of the emargination being black, the lateral posterior margins straight.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

#### Genus *MILEEWA* Distant

##### *Mileewa luzonica* sp. nov.

Vertex, pronotum, and scutellum ferruginous, the front margin of vertex and all below very pale yellowish, the tegmina washed with shining ferruginous. A large rectangular spot in middle of vertex, 2 round spots near basal margin of pronotum, a varying and indistinct median area on posterior half of pronotum, lateral angles of scutellum broadly, a narrow longitudinal band

on clavus within commissural margin and not reaching tip of clavus, a longitudinal band on corium bordering claval suture and passing into inner apical cell, and a band from base of tegmina passing to apex of first anteapical cell, black; area of apical cells smoky translucent. Length ♂ 4.5, ♀ 4.75 mm.

Length of face two and one-fourth times width between eyes, basal clypeal suture dis-

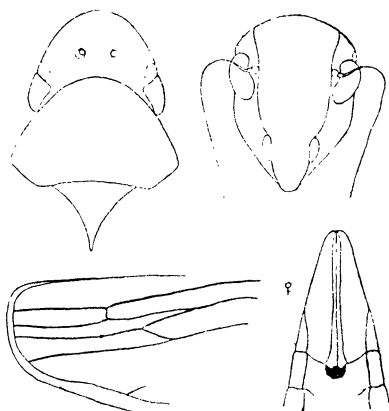


FIG. 5. *Makilingia pallida* sp. nov.

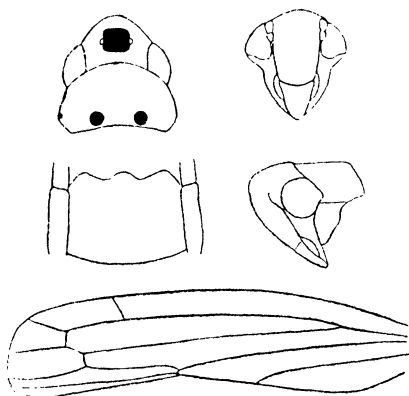


FIG. 6. *Mileewa luzonica* sp. nov.



tinged, the whole surface faintly shagreened; front and clypeus strongly convex, the former slightly flattened on disc above. Length of vertex about three-fourths of width between eyes, surface smoothly convex. Ocelli nearly on line of anterior margin of eyes, somewhat nearer to eyes than to each other. Pronotum smooth, the pleural carina very fine but complete. Scutellum wider than long, a fine impressed transverse line at middle. Tegmina opaque proximad of apical cells, but not at all coriaceous, and not at all punctate. If viewed squarely the hind margin of last ventral segment appears to be slightly incurved and with a median projection, the hind angles oblique; if viewed at a slight angle the hind margin appears to be deeply evenly emarginate.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

*Mileewa luzonica* var. *decolorata* var. nov.

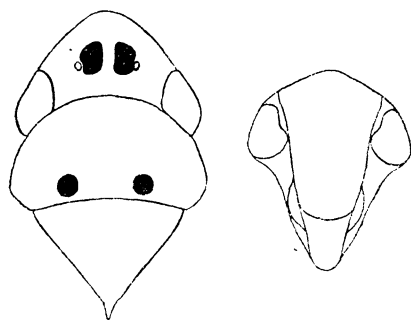


FIG. 7. *Mileewa luzonica* var. *decolorata* var. nov.

Body pale ochraceous throughout, the tegmina whitish subtransparent and smoky tipped. The quadrangular spot on vertex is divided into two along the median line. Pronotal spots as in *M. luzonica*. Length 4.5 mm.

The face is somewhat narrower in the single specimen than in typical *luzonica*, and the vertex is slightly longer, but otherwise it is very close

to the species, and at present must be placed with it.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

#### Genus UJNA Stål

*Ujna philippinensis* sp. nov.

Black, all below very pale yellowish. Vertex with 2 large lateral spots extending forward from eyes, 2 irregular spots involving the ocelli, 1 median stripe on posterior two-thirds which is broadened anteriorly and narrowly extended basally to eyes, and a narrowly triangular median spot at tip, pale yellowish. Scutellum with an indication of a median yellowish line anteriorly. Elytra deep smoky throughout, costal area subhyaline as far distad as apical cells, this area broadening distad

where it is crossed by a red dash on the line of an indistinct oblique cross nervure. Length 4 mm.

Front and clypeus very strongly convex and minutely shagreened, the former with 2 transverse black spots on upper margin. Second antennal article very large, longer than first. Vertex very long, narrowly rounded anteriorly, nearly smooth, coarsely shagreened just before tip, length once and a half the width between eyes, slightly impressed across ocelli. Ocelli very large, on the line of anterior margins of eyes and almost as far from median line as from eyes. Pronotum nearly smooth, the pleural carina complete. Scutellum wider than long, convex and nearly smooth anteriorly, deeply transversely foveate just behind middle, the posterior area minutely rugose. Hind margin of last ventral segment of female slightly incurved.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

This appears to be nearest to *U. consors* of Distant. The genera *Mileewa* and *Ujna* are very small and peculiar closely related tettigoniellids. As described by Distant they seemed to be quite distinct—*Mileewa* with its carinate vertex

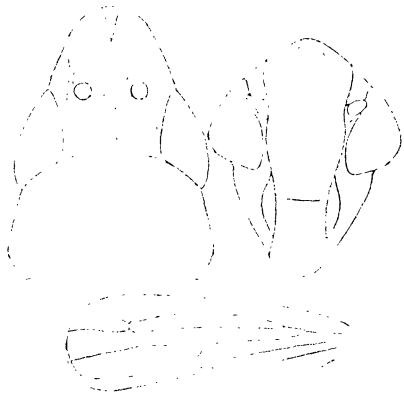


FIG. 8. *Ujna philippinensis* sp. nov.

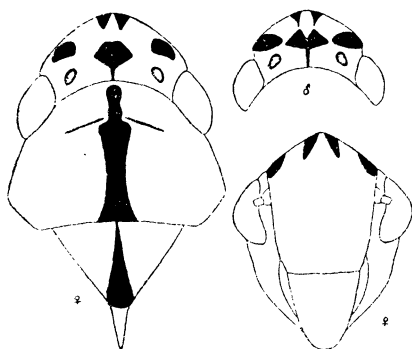
and truncate tegmina, and *Ujna* with its carinate front and rounded tegmina. Both genera have only 3 apical cells in the tegmina. Melichar<sup>2</sup> describes a new species which he names *Mileewa gillavryi*, which has the head form of *Mileewa*, but the wing form of *Ujna*. *Mileewa luzonica* described herein does not have a distinctly carinated vertex, nor does *Ujna philippinensis* have the carinated front. However, the *Mileewa* is evidently congeneric with the type of the genus and the *Ujna* even shows the general color plan of *Ujna delicatula* and *U. consors* of Distant. This leaves only the truncated tegmina on which to separate *Mileewa*. Melichar mentions the close resemblance of his *Mileewa gillavryi* to the type of *Ujna*, and I believe that it should be placed in that genus, if *Ujna* is to be kept separate from *Mileewa*.

<sup>2</sup> Notes Leyden Mus. (1914), 36, 125.

Genus **TETTIGONIELLA** Jacobi*Tettigoniella whiteheadii* Distant.

Very pale ochraceous throughout; tibiae and tarsi slightly darkened; 2 small black dots at tip of vertex, 2 spots on margin anterior to ocelli, 1 large median angulated black spot connected with basal margin of vertex by a median stripe, a variable median stripe on pronotum and scutellum, entire commissural margin of tegmina narrowly, and principal sectors of corium, dark brown to black. Tegmina concolorous, becoming smoky subhyaline apically. Length ♂ 9.5, ♀ 11 mm.

Length of face somewhat less than twice width between eyes. Face strongly swollen; the disc of front flattened, lateral areas with numerous transverse darker stripes, the upper angles of

FIG. 9. *Tettigoniella whiteheadii* Distant.

the front, and the upper angles of the flattened area, each with subtriangular black spots—extensions of those on the vertex. Face and vertex very finely shagreened. Head tumidly rounded in front, the anterior portion of vertex strongly convex, posterior third with a strongly impressed complete transverse area in which the ocelli are placed. Length of vertex somewhat more than half

width between eyes, slightly shorter in the male; anterior margin slightly incurved at eyes, much more strongly so in the male. Ocelli just behind the line of the anterior margins of the eyes, distinctly long oval in shape, and twice as far from the median line as from the eyes. Pronotum with a few scattered weak punctures and with very indistinct transverse wrinkles, the anterior third with a deep oblique groove on either side of median line. Scutellum about as wide as long, large acuminate-tipped, a little shorter than pronotum, the sharp transverse impressed line near middle of disc. Last ventral segment of female somewhat produced and strongly narrowly rounded.

LUZON, Laguna Province, Mount Maquiling and Mount Banahao (*Julian Valdez—coll. Baker*).

This species presents a remarkable superficial resemblance to *Tettigoniella spectra* var. *nigrilinea* Stål, and specimens may be found under that name in collections. But apart from minor

differences, the head in *whiteheadii* is narrower than pronotum and the disc of front is flattened. In these characters the species agrees with the genus *Kolla* of Distant. But the chief character mentioned by Distant for *Kolla*—the curvature of the anterior margin of vertex beyond eyes—varies widely in the sexes of many species of *Tettigoniella*, as it does in the species described above. In fact, so much does it vary, that in some species, the female might be typical *Kolla* and the male *Tettigoniella* so far as this character is concerned. In *Tettigoniella*, likewise, there is a wide range of flattening of the disc of the front. Distant himself figures species of *Tettigoniella* with head distinctly narrower than pronotum.

*Tettigoniella makilingensis* sp. nov.

Pale greenish yellow, below concolorous, with clypeus, tibiae apically, and tips of female valves, light green. Tip of vertex with a small black spot. Length ♀ 11 mm.

Head slightly broader than pronotum. Face nearly twice as long as width between eyes and strongly swollen. Outer genal margins nearly straight. Front with disc not flattened, the lateral areas with numerous darker transverse streaks. Face and vertex finely shagreened. Vertex with a sharply impressed median line, the anterior areas on either side of this strongly convex. Vertex strongly angularly produced, nearly as long as width between eyes, and a little longer than pronotum. Ocelli just in front of line of anterior margins of eyes, about as far from eyes as from median line. Pronotum with a few scattering very weak punctures, anteriorly with a transverse impressed groove, this groove strongly roundly bent cephalad near middle, straight at the sides. Scutellum smooth, with a sharp transverse impressed line behind middle of disc; width equalling length, and this much exceeding length of pronotum. Tegmina whitish translucent, apically transparent, the principal sectors of both clavus and corium brown and indistinctly beaded. Last ventral segment of female with hind margin broadly evenly rounded.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

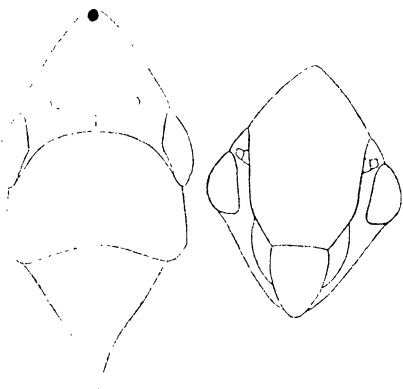


FIG. 10. *Tettigoniella makilingensis* sp. nov.

This species is nearest to *T. quinquenotata* Stål, but the latter is a smaller species, and apart from other differences, has the head narrower than the pronotum.

*Tettigoniella differentialis* sp. nov.

Pale green, legs white, vertex with a discal black spot and head with 2 black dots on margin in front of eyes; tegmina semi-transparent with brownish veins, the milky white wings underneath giving them an opaque appearance. Length ♀ 7 mm.

Length of face about once and a third width between eyes. Outer genal margins strongly sinuate below eyes. Face strongly swollen, the disc of front not at all flattened; lateral areas of front with numerous darker transverse stripes. Face and vertex finely shagreened. Head tumidly rounded in front, the vertex strongly convex anteriorly, impressed across the base. Length

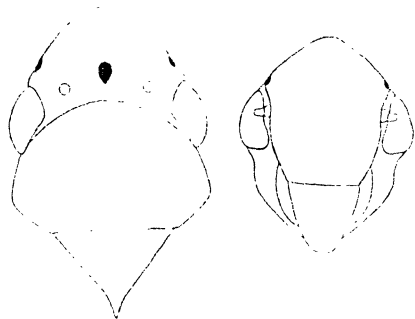


FIG. 11. *Tettigoniella differentialis* sp. nov.

of vertex about three-fourths of width between eyes, anterior margin slightly swollen just in front of eyes. Ocelli just behind lines of anterior margins of eyes, and much nearer to eyes than to median line. Pronotum with an evenly curved transverse impressed groove at anterior one-fourth, back of this the surface distinctly transversely wrinkled. Scutellum very

short acuminate tipped, much wider than long, the width nearly equal to length of pronotum. Last ventral segment of female somewhat produced, the hind margin narrowly rounded.

LUZON, Laguna Province, Mount Maquiling (*Julian Valdez—coll. Baker*).

This species is similar in coloration to *T. unimaculata* Sign., but the black spot on the vertex is behind the middle and much smaller, and the vertex is much longer. *Tettigoniella unimaculata* is referred to *Kolla* by Distant while *T. differentialis* could not possibly be so referred. It does not appear from the descriptions given that *T. unimaculata* of Distant is at all that of Signoret. Distant does not attempt to define the limits of variability of the species, as he determines it. Nor does it appear that the reference of *T. kinbergi* to *unimaculata* is at all final. Stål noted the resemblance, but considered them distinct.

## ILLUSTRATIONS

### TEXT FIGURES

(Drawings by C. F. Baker)

- FIG. 1. *Makilingia nigra* sp. nov.  
2. *Makilingia pruinosa* sp. nov.  
3. *Makilingia maculata* sp. nov.  
4. *Makilingia colorata* sp. nov.  
5. *Makilingia pallida* sp. nov.  
6. *Mileewa luzonica* sp. nov.  
7. *Mileewa luzonica* var. *decolorata* var. nov.  
8. *Ujna philippinensis* sp. nov.  
9. *Tettigoniella whiteheadii* Distant.  
10. *Tettigoniella makilingensis* sp. nov.  
11. *Tettigoniella differentialis* sp. nov.



## PHILIPPINISCHE HISTERIDEN: I <sup>1</sup>

Von H. BICKHARDT  
(Cassel, Germany)

Eine Tafel

Professor C. F. Baker vom College of Agriculture, University of the Philippines, in Los Baños hatte die Güte mir eine kleine Suite Histeriden von den Philippinen zu senden, die den nachstehend aufgeführten Arten angehören. Ich bin überzeugt, dass bei grösserem Material sich noch manche weitere Art für diese interessante Insel-Gruppe nachweisen lässt.

### **Hololepta elongata** Erichson.

*Hololepta elongata* ERICHSON, in Klug, Jahrb. Ins. (1834), 92; MARSEUL, Monogr. (1853), 190, t. 4, f. 31.

Ein kleines Exemplar vom Mt. Maquiling (Nr. 1959). Die Art ist über den ganzen Malayischen Archipel von Indien bis zu den Philippinen verbreitet.

### **Apobletes tener** Marseul.

*Apobletes tener* MARSEUL, Monogr. (1860), 859, t. 15, f. 5.

Die vorliegenden Stücke wurden bei Los Baños und am Mt. Maquiling gefunden (Nr. 1964). Auch in meiner Sammlung (ex coll. F. Schmidt) befinden sich mehrere Stücke von den Philippinen. Die Art scheint weit verbreitet zu sein. Mir liegen noch Exemplare vor von Java, Borneo, Sumatra und Formosa.

### **Apobletes feriatus** Lewis.

*Apobletes feriatus* LEWIS, Ann. Mag. Nat. Hist. (1902), VII, 10, 224.

Die Philippinischen Stücke stammen vom Mt. Maquiling (Nr. 1962). Lewis verglich die Art mit *A. tener* Mars. und *A. schaumii* Mars. Wenn ich die Exemplare richtig bestimmt habe, so ähneln die Tiere—abgesehen vom Sternum—viel mehr *A. corticalis* Lew. Sie sind von dieser Art verschieden durch ausgehntere, aber noch feinere Punktierung des Halsschildes, durch andere Punktierung des Propygidiums und durch ein geändertes Pygidium.

<sup>1</sup> Proof read by C. F. Baker.



**Apobletes fictitius** Lewis.

*Apobletes fictitius* LEWIS, Ann. & Mag. Nat. Hist. (1885) V, 16, 206.

*Apobletes difficile* SCHM., Ent. Nachr. (1889), 15, 334.

*Apobletes platysomoides* LEWIS, Ann. & Mag. Nat. Hist. (1891), VI, 8, 382.

*Apobletes semperi* LEWIS, Ann. & Mag. Nat. Hist. (1891), VI, 8, 382.

Diese Art ist von Professor Baker nicht gefunden worden. Ich besitze jedoch die Type von *A. difficile* Schm. von den Philippinen. Auch diese Art ist weit verbreitet und in meiner Sammlung durch Stücke von Borneo, Mentawai, und Sumatra vertreten.

**Platysoma (Platylister) charrali** Marseul.

*Platysoma (Platylister) charrali* MARSEUL, Monogr. (1861), 146, t. 3, f. 6.

Ein Stück dieser seltenen Art, die bisher nur von Borneo bekannt war, fand Professor Baker auf den Mt. Maquiling auf Luzon (Nr. 1958). Der Lateralstreif des Halsschildes setzt sich zuerst kräftig, dann feiner, am Hinterrand (Basis) fort.

**Platysoma (Platylister) corticinus** sp. nov.

Oblong-ovatus, subparallelus, subconvexus, niger, nitidus. Fronte cum clypeo antice concavo, stria transversa subrecta. Pronoto stria laterali antice interrupta. Elytris striis dorsalibus 1. et 2. integris, 3. late interrupta, 4. apicali punctiformi obsoleta vix notata, ceteris subhumeralibusque nullis. Propygidio lateribus fortiter ocellato-punctato, pygidio minus fortiter sed densius punctato, margine tenui elevato. Mesosterno antice emarginato, stria marginali in medio late interrupta. Tibiis omnibus 4-dentatis.

Long., 4.75–5.5 mm.

LUZON, Laguna, Los Baños (*Baker* Nr. 1648 et 1957).

Die Körperform ist länglich oval, fast parallelseitig. Die Stirn ist nur vorn, der Clypeus vollständig concav. Der Stirnstreif ist fein. Der Lateralstreif des Halsschildes ist etwas geschwungen, dem Rande vorn und hinten mehr genähert als in der Mitte der Seite; am Vorderrand hinter den Augen ist er unterbrochen. Der 4. Dorsalstreif fehlt meist ganz, zuweilen ist er durch einen undeutlichen apicalen Punkt angedeutet. Das Propygidium ist an den Seiten mit kräftigen Augenpunkten mässig dicht besetzt, die Mitte ist fast glatt. Das Pygidium ist dichter und etwas feiner punktiert, es hat einen ziemlich scharfen erhobenen Aussenrand. Der Randstreif des Mesosternums ist vorn breit unterbrochen. Von den 4 Zähnen der Hinterschienen ist das basale Zahnchen sehr klein und leicht zu übersehen.

Die neue Art ist mit *P. abruptus* Er. und *ramoicola* Mars. nahe verwandt, sie gleicht diesen Spezies in Grösse und Habitus vollkommen. Sie unterscheidet sich von beiden durch das dichter und feiner punktierte Pygidium; von *abruptus* ferner durch den unterbrochenen Lateralstreif des Halsschildes und den ebenfalls unterbrochenen Mesosternalstreif. Von *ramoicola* ist die Art ausserdem verschieden durch den breit unterbrochenen 3. Dorsalstreif.

**Platysoma (Platylister) ovatum** Erichson.

*Platysoma ovatus* ERICHSON, in Klug, Jahrb. Ins. (1834), 1, 108; MARSEUL, Monogr. (1853), 257, t. 7, f. 1.

Auch diese Art ist über den Malayischen Archipel weit verbreitet. Die vorliegenden Stücke wurden in Los Baños (Nr. 1643) gefunden.

**Platysoma (Platylister) abruptum** Erichson.

*Platysoma abruptum* ERICHSON, in Klug, Jahrb. Ins. (1834), 1, 109; MARSEUL, Monogr. (1853), 257, t. 7, f. 2; (1861), 142, t. 3, f. 2.

*Platysoma gorhami* LEWIS, Ann. & Mag. Nat. Hist. (1889), VI, 3, 278; (1893), VI, 11, 418.

Die beiden mir vorliegenden Exemplare von Los Baños (Nr. 1649 und 1650) entsprechen sowohl der Beschreibung des *Platysoma gorhami* Lew. wie auch der des *Platylister abruptus* Er., die ich sowohl nach Erichson wie nach Marseul verglichen habe. Lewis hat bei Beschreibung seines *gorhami* offenbar vergessen, die Art mit *abruptus* zu vergleichen; dies hat seinen Grund darin, dass er die Art als eine afrikanische ansah (er gibt 1889 als Fundort Zansibar an, berichtet dann 1893 in Philippinen). *P. gorhami* Lew. ist identisch mit *P. abruptum* Er.

**Platysoma (Platylister) striatiderum** Marseul.

*Platysoma striatiderum* MARSEUL, Monogr. (1853), 270, t. 7, f. 15.

Diese Art gehört wegen des erhabenen gerandeten Pygidiums zur Untergattung *Platylister* Lew. Sie wurde von Professor Baker bei Los Baños aufgefunden (Nr. 1640).

Auch die folgenden Arten müssen wegen des gerandeten Pygidiums in die Untergattung *Platylister* gestellt werden: *P. birmanum* Mars., *jobiense* Mars., *pini* Lew., *sesquistriatum* Mars., *contiguum* Mars., *emptum* Mars.

**Platysoma (s. str.) luzonicum** Erichson.

*Platysoma luzonicum* ERICHSON, in Klug, Jahrb. Ins. (1834), 1, 111; MARSEUL, Monogr. (1853), 265, t. 7, f. 10.

Mehrere Stücke von Los Baños (Nr. 1645).

**Platysoma (s. str.) uniforme** Lewis.

*Platysoma uniforme* LEWIS, Ann. & Mag. Nat. Hist. (1894), VI, 14, 176.

Die bei Los Baños (Nr. 1642) gefundene Art scheint hierher zu gehören. Das basale Rudiment des 3. Dorsalstreifs ist sehr undeutlich und nur bei seitlich auffallendem Licht schwach wahrnehmbar. Der 5. Dorsalstreif ist kürzer als von Lewis angegeben, er erreicht nicht die Mitte der Flügeldecke sondern nur etwa zwei Fünftel derselben.

**Platysoma (Cylistosoma) dufali** Marseul.

*Platysoma dufali* MARSEUL, Abeille I (1864), 310.

*Platysoma scitutum* LEWIS, Ann. & Mag. Nat. Hist. (1889), VI, 3, 280.

Der Diagnose von Marseul und auch der von Lewis ist noch hinzuzufügen, dass die Augenpunkte auf dem Propygidium viel grösser sind als auf dem Pygidium.

LUZON, Laguna, Los Baños (Baker Nr. 1651).

**Liopygus diopsipygus** Marseul.

*Apobletus diopsipygus* MARSEUL, Ann. Mus. Genova (1879), 14, 259.

Ein kleines Exemplar von Los Baños (Nr. 1646). Die Art wurde bisher gefunden in Java (Teijbodas), Perak und Sumatra; sie scheint weit verbreitet zu sein.

**Santalus philippinarum** sp. nov.

Elongatus, parallelus, convexus, niger, nitidus, fronte subconvexa, stria frontali antice recta; mandibulis curvatis, basi extus marginatis. Thorace ciliato; striis lateralibus basin attingentibus, versus basin convergentibus, interna antice integra, in angulo antico rotundato. Elytris stria subhumerali interna, dorsalibus 1.-3. integris, 4. antice vix abbreviata vel integra, 5. ultra medium abbreviata. Propygidio pygidioque sat fortiter punctatis. Mesosterno stria marginali antice integra obsoleta. Tibiis anticis 3-dentatis.

Long., 8 mm.

Philippinen.

Der Körper ist länglich parallelseitig, oben mässig gewölbt. Der Stirnstreif ist vorn nahezu grade. Die Mandibeln sind ziemlich stark gekrümmt, aussen nahe der Basis gerandet, auf der Oberseite flach, kaum concav. Die Lateralstreifen des Halsschildes erreichen die Basis und convergieren nach hinten. Der innere Lateralstreif ist vorn im flachen Bogen stumpfwinkelig zum Vorderrand des Halsschildes gebogen (bei dem verwandten *piraticus* Lew. geht der innere Lateralstreif weiter nach vorn

und biegt dann spitzwinkelig gerundet nach hinten zum Vorderrand des Halsschildes um; ferner verlaufen bei dieser Art die Lateralstreifen parallel zu einander oder nähern sich gar vorn mehr einander als hinten). Der 5. Dorsalstreif reicht bis zur Mitte der Flügeldecke nach vorn oder noch etwas darüber hinaus, er ist parallel zur Naht. Das Propygidium ist ziemlich kräftig und mässig dicht, das Pygidium kaum feiner und dichter punktiert. Der Marginalstreif des Mesosternums ist vorn nicht unterbrochen, aber undeutlich.

Das typische Exemplar wurde am Mt. Maquiling auf Luzon von Professor Baker erbeutet (Nr. 1644). Ein Stück meiner Sammlung, Mindoro (ex coll. Schmidt), das irrtümlich als *S. congruens* Mars. bestimmt war,<sup>2</sup> gehört unzweifelhaft hierher, trotzdem die Mandibeln etwas länger und stärker concav sind. Es wird das andere Geschlecht (♂) sein.

Die bekannten Arten der Gattung *Santalus* Lew. lassen sich, wie folgt, auseinanderhalten. Sie sind sämtlich in meiner Sammlung vertreten.

*Tabelle der Santalus Arten.*

- a*<sup>1</sup>. Die Flügeldecken haben einen kräftigen Nahtstreif und 2 subhumeralstreifen (Indien, Birma)..... *S. latitibius* Mars.
- a*<sup>2</sup>. Die Flügeldecken haben keinen Nahtstreif. Der äussere Subhumeralstreif fehlt (höchstens ist eine punktförmige Andeutung an der Schulter vorhanden).
- b*<sup>1</sup>. Der äussere Lateralstreif des Halsschildes ist nach hinten abgekürzt, er erreicht nicht die Basis.
- c*<sup>1</sup>. Die Vorderschienen haben 4 Zähnnchen, das Zähnnchen nächst der Basis ist klein und undeutlich. Der 4. Dorsalstreif ist an der Basis um etwa ein Drittel verkürzt (Lombok)..... *S. congruens* Mars.
- c*<sup>2</sup>. Die Vorderschienen haben 3 Zähne; der 4. Dorsalstreif der Flügeldecken ist vollständig oder an der Basis ganz wenig abgekürzt.
- d*<sup>1</sup>. Die Körperform ist oval; das Propygidium ist ziemlich kräftig und mässig dicht punktiert (Indien, Ceylon). *S. orientalis* Payk.
- d*<sup>2</sup>. Der Körper ist oblong; das Propygidium ist äusserst fein und seicht punktuert (glatt erscheinend), *elongatulus* Mars. (Indien)..... *S. parallelus* Redt.
- b*<sup>2</sup>. Der äussere Lateralstreif des Halsschildes reicht bis zur Basis.
- e*<sup>1</sup>. Das Propygidium und Pygidium sind glatt; höchstens finden sich seitlich einige flache Punkte. (Die Mandibeln haben eine lange, fein ausgezogene Spitze.) (Celebes.)  
*S. mandibularis* Schmidt.
- e*<sup>2</sup>. Das Propygidium und Pygidium sind punktiert.
- f*<sup>1</sup>. Der Körper ist oblong, seitlich schwach gerundet. Die Hinterschienen sind weniger stark verbreitert.

<sup>2</sup> Zu diesser Art kann das Stück nicht gehören, denn die Vorderschienen haben nur 3 Zähne, der äussere Lateralstreif des Halsschildes erreicht die Basis und der 4. Dorsalstreif ist länger.

*g*<sup>1</sup>. Die Lateralstreifen des Halsschildes sind parallel, der Zwischenraum ist weit. Das Mesosternum ist vorn deutlich und vollständig gerandet (Celebes).

*S. rupestris* Mars.

*g*<sup>2</sup>. Die Lateralstreifen des Halsschildes convergieren nach hinten, ihr Zwischenraum ist vorn an den Vorderecken beinahe doppelt so breit als hinten nahe der Basis. Das Mesosternum ist in der Mitte des Vorderrandes nicht, oder obsolet, gerandet (Celebes)..... *S. tabellio* Mars.

*f*<sup>2</sup>. Der Körper ist langgestreckt, cylindrisch, fast parallelseitig. Die Hinterschienen sind sehr stark verbreitert.

*h*<sup>1</sup>. Die Lateralstreifen des Halsschildes sind parallel, der 4. Dorsalstreif convergiert etwas mit der Naht der Flügeldecken nach vorn (Timor).... *S. piraticus* Lew.

*h*<sup>2</sup>. Die Lateralstreifen des Halsschildes convergieren nach hinten. Der 4. Dorsalstreif verläuft parallel zur Naht (Philippinen)..... *S. philippinarum* Bickh.

*Hister (Atholus) bakeri* sp. nov.

Ovatus, convexus, niger, nitidus; antennis pedibusque rufopiceis; fronte plana, stria semihexagona valida antice recta; pronoto stria laterali interna unica antice interrupta hamata, marginali lateribus et antice integra; elytris striis subhumeralibus nullis, dorsalibus 1.4 integris, 5 suturalique dimidiatis, crenatis. Propygidio pygidioque sparse punctatis. Mesosterno antice obtuso, stria marginali integra; tibiis anticis dilatatis 4-dentatis.

Long., 4.5 mm.

Philippinen.

Die Körperform ist oval, ziemlich stark gewölbt, die Oberseite ist glänzend schwarz. Die Fühler und Beine sind rotbraun. Die Stirn ist eben, der Stirnstreif ist vorn ganz gerade und sein Innenrand ist etwas (mässig) eingedrückt. Das Halsschild hat einen Lateralstreif, der an der Basis und vorn verkürzt ist, an der Vorderecke endigt dieser Streif in einem einwärts gebogenen Häkchen. Der Marginalstreif reicht ununterbrochen um Vorder- und Seitenrand herum. Die Flügeldecken haben 4 vollständige Dorsalstreifen, der 5. und Nahtstreif reichen etwa bis zur Mitte der Flügeldecken nach vorn. Das Propygidium und Pygidium sind ziemlich fein und weitläufig punktiert, gegen die Spitze wird die Punktierung des Pygidiums feiner und dichter. Das Prosternum hat keine Streifen. Das Mesosternum ist vorn zugerundet und mit einer kräftigen Randlinie versehen. Die Vorderschienen haben 4 Zähnen, von denen der grössere Spitzenzahn dreieckig vorgezogen ist.

Die neue Art ist mit *Atholus torquatus* Mars. am nächsten verwandt. Die Körperform ist aber oval, stärker gewölbt, die

Oberseite ist nicht punktiert, der Stirnstreif ist vorn ganz gerade (bei *torquatus* schwach einwärts gebogen), der Nahtstreif der Flügeldecken ist etwas kürzer. Das Pygidium ist ebenso punktiert wie das Propygidium.

Professor Baker fand die Art bei Los Baños (Nr. 1639).

*Epierus nasicornis* sp. nov. Tafel I.

Ovalis, convexus, niger, nitidus; antennis pedibusque rufis; fronte antice in medio cornuta, circa impressa. Thorace sublaevi, stria marginali integra; elytris striis dorsalibus 1.-5. suturalique integris (3 internis partim obsoletis). Propygidio pygidioque subtiliter sparsum punctulatis. Prosterno bistriato, striis utrinque modice divergentibus, lobo magno antice obtuso; mesosterno antice subrecto, stria marginali integra. Tibiis anticis breviter multispinosus.

Long., 2.20 mm.

Philippinen.

Die neue Art ist die einzige der Gattung *Epierus* mit einem regelrechten Kopfhorn. Am Vorderrand der Stirn, wo Stirn und Epistom zusammenstossen, steht gerade nach vorn gerichtet ein wohlausgebildetes Horn. Unmittelbar daneben und dahinter ist die Stirn etwas eingedrückt, ebenso ist der Clypeus concav. Von den 6 vollständigen Rückenstreifen der Flügeldecken sind die 3 inneren (einschliesslich des Nahtstreifens) auf der Scheibe sehr fein und nur durch Punktreihen angedeutet, sie sind oft nur bei schräg auffallendem Licht, zusehen. Das Propygidium und das Pygidium sind sehr fein (das letztere noch feiner als das erstere) und spärlich nadelstichartig punktiert. Diese Kehlplatte des Prosternums ist sehr gross und vorn quer abgestutzt. Das Mesosternum ist am Vorderrand fast gerade, das Prosternum ist mit seiner geraden Basis unmerklich in das Mesosternum eingelassen.

LUZON, Laguna, Los Baños (*Baker* Nr. 1647).

*Paromatus* (s. str.) sp.

Zwei Stücke aus Los Baños (Nr. 1641) ohne Auszeichnung auf dem Pygidium, jedoch mit in toto flach eingedrücktem ersten Abdominal-segment lassen sich unter den bekannten Arten der Gattung nicht unterbringen. Dass die Gattung dringend der Revision bedarf sehe ich vorläufig von einer Beschreibung ab.



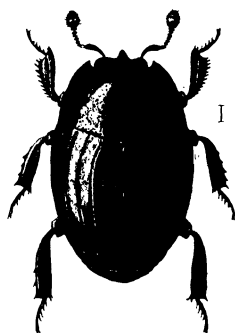
## TAFELERKLÄRUNG

TAFEL I. *Epiurus nasicornis* sp. nov.

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TAFEL I. EPIERUS NASICORNIS SP. NOV.



## NEUE FULGORIDEN VON DEN PHILIPPINEN: II<sup>1</sup>

Von L. MELICHAR  
(Brünn, Austria)

Eine Tafel

DERBINÆ

### *Zoraida flavicornis* sp. nov.

♂: Blassgelblich, Augen braun, Kopf rötlich. Die langen Fühler flach, zusammengedrückt, gelblichweiss, äusserst fein braun gekörnt, die Ränder rötlich, an der Spitze eingekerbt, in der Einkerbung die kurze schwarze Borste eingefügt. Pronotum fast weiss, der Vorderrand rötlich, Schildchen gewölbt, die Längskiele undeutlich, auf dem Metanotum 2 braune Punkte. Hinterleib blassgelblich, auf dem 4. oder 5. Rückensegmente jederseits 2 braune Fleckchen, die Spitze (Genitalapparat) rötlich, Deckschuppen rot. Flügeldecken hyalin, der Costalrand rötlichgelb, der äusserste Rand, die Apikalrandadern und sämtliche Adern pechbraun. Die ersten 3 Apikaladern besitzen einen runden braunen Punkt, aus welchem sie verdünnt und farblos zum Apikalrande ziehen. Flügel kurz, rudimentär. Unterseite und Beine blassgelb, Hinterschienen mit einem Dorne hinter der Mitte.

♀ unbekannt.

Länge des Körpers, 4 mm.; der Flügeldecken, 10 mm.

LUZON, Laguna, Los Baños und Mount Maquiling (2 Exemplare in meiner Sammlung, C. F. Baker.)

### *Zoraida puncticosta* sp. nov.

♀: Blass grünlichgelb, Augen braun. Das 2. Fühlerglied lang, zusammengedrückt, an der Spitze eingekerbt, in der Einkerbung die Fühlerborste eingelenkt, blassgrün, mit feinen braunen Körnchen besetzt, die Spitze rötlich, Kopf und pronotum blassgrün, letzteres in der Mitte nicht gekielt. Schildchen mit mehreren braunen Flecken und Punkten und zwar 2 Längsstriche an der Basis, 2-3 Punkte an den Seiten, 2 Punkte an der Apikalspitze und von diesen jederseits eine schiefe Querlinie zur Flügeldeckenbasis. Hinterleib grünlich, auf den Seiten des 4.

<sup>1</sup> Proof read by C. F. Baker.

Rückensegmentes jederseits 2 braune einandergenäherte Mac-  
keln, die Mitte des Bauches pechbraun. Flügeldecken lang,  
hyalin, der Costalrand gelblich, die Costalrandader an der Basis  
von 2 schwarzen Linien begrenzt, dann bis zur Spitze mit klein-  
eren und grösseren schwarzen Punkten besetzt; die Adern  
gelblich. Flügeln sehr klein, rudimentär. Beine blassgelblich,  
Schenkel an der Spitze auf der Unterseite mit einem braunlichen  
Fleck, Hinterschienen mit einem Dorne hinter der Mitte, die  
Spitze desselben dunkel.

♂ unbekannt.

Länge des Körpers, 4 mm.; der Flügeldecken, 11 mm.

LUZON, Laguna, Mount Maquiling (1 Exemplar, C. F. Baker).

*Zoraida dorsopunctata* sp. nov.

♂ : Körper gelblichbraun. Die langen flachen Fühler pech-  
braun, fein gekörnt. Pronotum schmutzigweiss, die Seiten  
braun. Schildchen gewölbt, mit 3 deutlichen Längskielen, die  
Scheibe mehr oder weniger dunkel. Auf dem Hinterleibsrücken  
befinden sich jederseits 3 Reihen von schwarzen Punkten, welche  
nach hinten zur Mittellinie konvergieren. Die Ränder der Ge-  
nitalsegmente schwarz. Metanotum stark kugelig gewölbt,  
pechbraun. Bauch pechbraun, Brust schmutziggelb, an den  
Seiten braun gefleckt. Flügeldecken hyalin, am Costalrande  
gelblichbraun, nicht gefleckt, die Adern braun, auf den Apikal-  
adern keine dunklen Punkte vor dem Apikalrande, letzterer  
sowie der Hinterrand schmal braun gesäumt. Flügel kurz, rudi-  
mentär. Beine schmutziggelb, die Schienen dunkler, die Basis  
der Hinterschenkel schwarzlich. Hinterschienen mit einem  
Dorne hinter der Mitte.

♀ unbekannt.

Länge des Körpers, 5 mm.; der Flügeldecken, 11.5 mm.

LUZON, Laguna, Mount Maquiling (1 Exemplar, C. F. Baker).

#### Genus *NEOCAMMA* novum

Der Gattung *Camma* Distant sehr ähnlich. Die Costalmem-  
brane ist breit, so breit wie die nächste Zelle, aber nicht an der  
Basis wie bei *Camma* (*dilatata* Dist.) vorgewölbt, der Scheitel  
klein, dreieckig, die Stirne von der Seite betrachtet gerundet  
aber nicht vorgewölbt, so dass die Wangen sehr schmal sind.  
Die Stirnränder einander berührend, an der Clavusbasis diver-  
gierend, ein kleines Stirndreieck bildend. Clypeus bedeutend  
länger als die Stirne, in der Mitte und an den Seiten fein gekielt.  
Die Fühler unter den halbkugeligen, am Unterrande schwach  
gebuchteten Augen eingelenkt, den Stirnrand weit überragend.

das 2. Fühlerglied fast dreimal so lang als breit, cylindrisch, Fühlerborste apikal eingefügt. Pronotum in der Mitte schmal, nach aussen erweitert, Schildchen gewölbt, mit 3 Längskielen, die Seitenkiele etwas furchenartig vertieft. Metanotum dreieckig, gewölbt, in der Mitte mit einer Längsfurche Flügeldecken lang, schmal, in der Mitte am breitesten. Der Verlauf der Adern wie bei *Camma*, die Radialzelle ist aber nicht so breit wie bei *Camma*. Die Flügel ungefähr halb so lang wie die Flügeldecken, lanzettlich, nach hinten nicht erweitert, mit einer Ader in der Mitte welche nach beiden Seiten kurze Äste zum Vorbeziehungsweise Hinter-rande sendet, nach innen zu eine kurze Gabelader. Beine grazil, Hinterschienen mit einem Dorne hinter der Mitte.

Von der Gattung *Camma* Dist., durch die an der Basis nicht erweiterte Costalmembrane der Flügeldecken, die längeren Fühler und die lanzettlich geformten Flügel, sowie die mit einem Dorne versehenen Hinterschienen verschieden.

Typ. gen. *Neocamma trifasciata* sp. nov.

*Neocamma trifasciata* sp. nov. Tafel I, Fig. 1-4.

♀: Körper gelblichbraun ohne Zeichnung. Flügeldecken hyalin mit 3 braunen Querbinden, der Costal- und Apikalrand mit braunen Flecken. Der nervus radialis ist rötlich, die übrigen Adern braunlichgelb. Beine gelblich.

♂ unbekannt.

Länge des Körpers, 2.75 mm.; der Flügeldecken, 7 mm.

LUZON, Laguna, Mount Maquiling (1 Exemplar, C. F. Baker).

#### Genus **ACANTHOCERA** novum

Kopf samt Augen klein, der Scheitel als kleines Dreieck an der Basis erkennbar, die Stirne von der Seite betrachtet gerundet, nicht vorgewölbt, die Wangen daher schmal, die Stirne von vorne linear, die Ränder zusammenschliessend bis zur Spitze, Augen halbkugelig, die Fühler die Augen überragend, das 2. Fühlerglied mehr als doppelt so lang wie breit, cylindrisch, an der Aussenseite mit einem breiten Zahne versehen, wodurch sich diese Gattung von allen anderen bekannten Gattungen unterscheidet. Clypeus gross, breit, in der Mitte und an den Seiten undeutlich fein gekielt, Rostrum die Hinterhüften überragend. Pronotum in der Mitte sehr schmal, die hintere stumpfwinkelige Ausbuchtung fast den Vorderrand erreichend, die Seiten blattartig erweitert. Schildchen breiter als lang, vor der Spitze quer eingedrückt, mit 3 undeutlichen Längskielen. Flügeldecken lang, schmal, hinter der Mitte am breitesten; das Geäder

ist aus der Abbildung ersichtlich. Flügel kaum halb so lang wie die Flügeldecken, ziemlich breit, hyalin. Beine grazil, Hinterschienen nicht bedornt.

Typ. gen., *Acanthocera punctifrons* sp. nov.

*Acanthocera punctifrons* sp. nov. Tafel I, Figs. 5-8.

♀ : Blassgrün, Augen braun, auf der Stirne 5 schwarze Punkte, welche sich auf die Stirnränder ausdehnen und daher auch von der Seite sichtbar sind. Flügeldecken hyalin, mit gelblich-braunen Adern und zahlreichen hell braunlichgelben Makeln, hinter der Basalzelle, an der Teilungsstelle des nervus radialis und hinter der Clavusspitze eine dunkle pechbraune Makel. Hinterleib, Unterseite und Beine blassgrün, auf der Aussenseite der Vorderschienen an der Basis und in der Mitte je ein schwarzer Punkt.

♂ unbekannt.

Länge des Körpers, 2 mm.; der Flügeldecken, 6 mm.

LUZON, Laguna, Los Baños (1 Exemplar, C. F. Baker).

*Fenuahala maculipennis* sp. nov.

♀ : Schmutzig gelblichweiss. Scheitel dreieckig, doppelt so breit wie der Querdurchmesser des Auges, die Seiten geschärft und aufgerichtet, mit sensiblen Organen besetzt. Stirne schmal, die Ränder nur in der Mitte einander berührend, nach oben und unten divergierend. Von der Seite betrachtet gerundet, die Wangen kaum die Hälfte des Längendurchmessers des Auges breit. Fühler in der unteren Wangenecke eingelenkt, den Unter- rand des Auges erreichend, das 2. Fühlerglied doppelt so lang wie breit, cylindrisch. Clypeus breit, gewölbt, nicht gekielt. Pronotum schmal, seitlich verbreitert. Schildchen mit 3 Kielen, die seitlichen schwach gebuchtet. Auf den Wangen eine braunliche undeutliche Makel, in den hinteren Scheitecken ein schwarzer Punkt, sonst mit weissem Sekret mehr oder weniger bedeckt. Flügeldecken lang, hyalin, mit zahlreichen rauchbraunen zusammenfliessenden Makeln, vor der Apikalspitze dort wo die beiden Äste des nervus radialis sich verbinden eine rundliche dunklere Makel. Flügel mehr als die Hälfte der Flügeldecken lang, breit, hyalin. Hinterleibsbasis pechbraun, die Spitze hell. Beine blass gelblichweiss, die Kanten der Schenkel schwarz, die Schienen etwas verdunkelt, die Spitze der Hinterschienen und der Hintertarsen schwarz.

♂ unbekannt.

Länge des Körpers, 3.5 mm.; der Flügeldecken, 6 mm.

LUZON, Mount Maquiling (1 Exemplar, C. F. Baker).

**Mecynorhynchus hyalinus** sp. nov.

♂ : Kleine, sehr zarte Derbine. Körper und Beine wachsgelb, auf der Aussenseite des Scheitelrandes eine kleine rote Makel. Flügeldecken etwas schwach milchig getrübt, hyalin, mit weissen Adern, ein sehr kleiner roter Punkt am Costalrande im ersten Drittel. Die Bildung des Kopfes und Verlauf der Adern in den Flügeldecken wie bei *M. kershawi* Kirk., von dieser durch die hyalinen, nicht dunklen Flügeldecken verschieden.

♀ unbekannt.

Länge, ungefähr 3 mm.

LUZON, Laguna, Los Baños (1 Exemplar, C. F. Baker).

**Rhotana punctovenosa** sp. nov.

Kopf und Thorax schmutzig gelblichweiss. Die Wangen hyalin, mit 2 schwarzen Strichen, der eine vor dem Auge, der zweite vertikal auf der Aussenseite des Scheitelrandes. Auf dem Schildchen 2 diffuse braunliche Makeln und 2 kleine Pünktchen vor der Spitze, Flügeldecken breit, hyalin, graulichweiss, stellenweise braunlich geflekt, die Adern karmoisinrot, schmal hell gerandet, mit starken braunen Punkten besetzt. Ungefähr 10 schwarzbraune Punkte befinden sich am Costalrande und zwar von der Basis bis zur Wölbung der Flügeldecken. Flügel milchweiss getrübt. Hinterleib schwach rötlich, Beine rostgelb. Diese Art ist durch die punktierten Adern und den Costalrand besonders gekennzeichnet.

Länge, 5 mm.

LUZON, Laguna, Los Baños (C. F. Baker).

**Rhotana excelsa** sp. nov.

Körper blassgelblich, die Stirn und Scheitelränder und der Clypeus orangegelb., Augen braun, Flügeldecken breit, hyalin, glashell, glänzend, der Costalrand blass citronengelb. Von der Mitte dieses Costalsaumes zieht eine ebenso gefärbte halb-mondförmige Binde in der Mitte der Flügeldecken, erweitert sich an der konvexen Seite breit bis zum Schlussrande und mündet in den Costalrand, ohne sich mit dem Costalsaum zu verbinden. Dasselbst befindet sich eine kleine braunliche Randmakel, anschliessend an diese ein roter Fleck. Die Adern sehr zart, gelblich. Flügel breit, in der Mitte blass citronengelb, am Apikalrande vor der Spitze eine grosse schwarze dreilappige Makel, vorne von einem blutroten Fleck begrenzt; in den mittleren Lappen befindet sich ein weisser Punkt. Beine blassgelb. Der *R. latipennis* Walk. ähnlich, durch die Zeichnung verschieden und leicht zu erkennen.



Länge, 5 mm.; Spannweite, 7-8 mm.

LUZON, Laguna, Los Baños und Mount Maquiling (*C. F. Baker*).

*Rhotana basipunctulata* sp. nov.

♀ : Körper blassgelblich, Augen braun, Flügeldecken hyalin, stark irisierend, mit blass-gelblichen Adern, die Queradern blass-bräunlich gesäumt, so dass 2-3 Querbinden entstehen. Auf dem nervus radialis nahe der Basis befinden sich 3 schwarze Punkte welche in einer Längsreihe stehen. Unterseite und Beine blassgelb. Nach den 3 Punkten auf der ersten Längsader ist diese Art leicht zu erkennen.

♂ unbekannt.

Länge samt Flügeldecken, 3 mm.

LUZON, Laguna, Los Baños (1 Exemplar, *C. F. Baker*).

## TAFELERKLARUNG

### TAFEL I

FIG. 1-4. *Neocanma trifasciata* sp. nov.

5-8. *Acanthocera punctifrons* sp. nov.



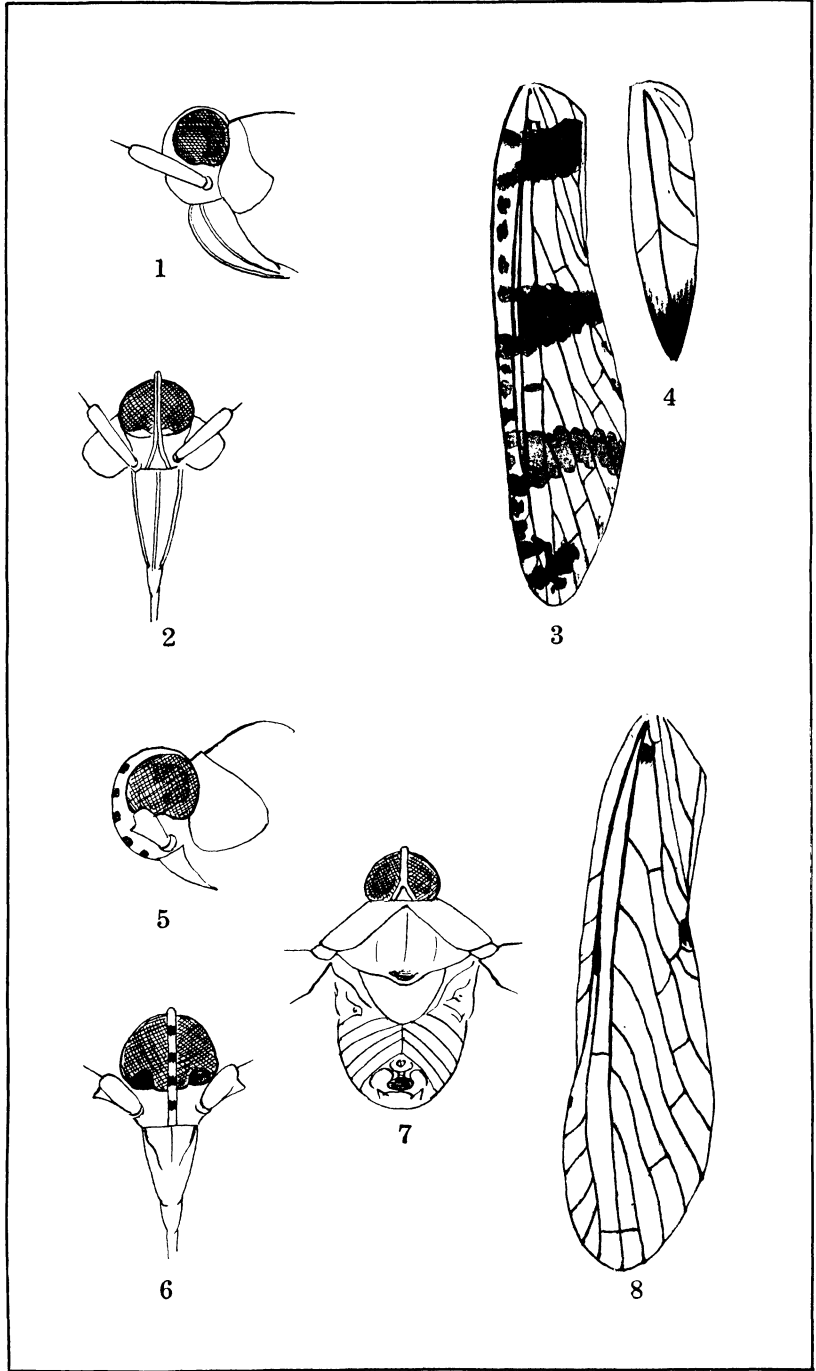


Fig. 1-4. *Neocamma trifasciata* sp. nov. 5-8. *Acanthocera punctifrons* sp. nov.



## ELATERIDÆ DES ILES PHILIPPINES \*

Par ED. FLEUTIAUX

(Nogent-sur-Marne, France)

Les Elaterides décrits en suite sont partie d'une collection que j'ai reçu de M. C. F. Baker, professeur d'agronomie au Collège d'Agriculture de Los Baños, îles Philippines.

**Agrypnus bifeveatus** Candèze.

Mon. Elat. (1857), 1, 23, 41; Révis, Mon. Elat. (1874), 3.

LUZON, Laguna, Los Baños.

**Lacon cervinus** Erichson.

Nov. Act. Ac. Lesp. Carol. (1834), 16; Suppl., 1, 230. CANDÈZE,  
Révis. Mon. Elat. (1874), 48, 78.

LUZON, Laguna, Mont Maquiling.

**Meristhus nigrifolius** Candèze.

Elat. nouv. (1893), 10. FLEUTIAUX, Ann. Soc. ent. belg. (1895), 167.

LUZON, Laguna, Los Baños.

N'était connu que de Sumatra.

**Alaus scytale** Candèze.

Mon. Elat. (1857), 1, 214, 228; Révis. Mon. Elat. (1874), 120; Ann.  
Mus. Civ. Gen. (1878), 106.

LUZON, Laguna, Mont Maquiling.

Décrit d'abord des Philippines, puis trouvé ensuite à Célèbes et en Nouvelle Guinée.

**Æolus beccarii** Candèze.

Ann. Mus. Civ. Gen. (1878), 117.

LUZON, Laguna, Los Baños.

Espèce décrite de Makassar, au même temps qu'une autre très voisine, *Æ. multilineatus* et placées toutes deux par l'auteur dans le genre *Heteroderes*. La dernière se trouve également en Malaisie.<sup>1</sup>

\* Proof read by C. F. Baker.

<sup>1</sup> Candèze, *Ann. Mus. Civ. Gen.* (1894), 488.

**Heteroderes drasterioides** Fleutiaux.

Ann. Soc. ent. France (1894), 686.

LUZON, Laguna, Los Baños.

D'Annam et de Saïgon. Est avec *H. intermedius* Cand. très voisin, de *H. triangularis* Esch. et de *H. proximus* Fleut.

**Drasterius sulcatulus** Candèze.

Mon. Elat. (1859), 2, 423, 427.

LUZON, Laguna, Los Baños.

Décrit de l'Hindoustan. Cité du Bengale<sup>2</sup> et de Sumatra.<sup>3</sup>

**Megapenthes inconditus** Candèze.

Mon. Elat. (1859), 2, 493, 504; Compt. rend. Soc. ent. belg. (1875), 122; Ann. Mus. Civ. Gen. (1878), 122.

LUZON, Laguna, Los Baños.

Les individus de M. Baker appartiennent à la variété citée par Candèze (1875). Se trouve aussi à Célèbes.

**Megapenthes juncus** Candèze.

Elat. nouv. (1864), 1, 30; Compt. rend. Soc. ent. belg. (1875), 122; Ann. Mus. Civ. Gen. (1878), 122.

LUZON, Laguna, Mont Maquiling.

Je rapporte presque sans aucun doute à cette espèce l'exemplaire récolté par M. Baker, malgré quelques différences avec la description, notamment en ce qui concerne la couleur des pattes qui sont jaunes. Se rencontre également à Bornéo.

**Megapenthes juncus** variété *candezei* (var. Cand., 1875).

LUZON, Laguna, Mont Maquiling.

Diffère par une tache en form d'O sur le front, une tache obscure sur le disque du pronotum et les côtés de celui-ci, avec ses angles postérieurs plus ou moins noirâtres.

**Megapenthes angulosus** Candèze.

Compt. rend. Soc. ent. belg. (1875), 122.

LUZON, Laguna, Los Baños.

**Megapenthes luzonicus** sp. nov.

Allongé, assez convexe, d'un brun noirâtre avec la base des élytres jaune et le voisinage de la suture des élytres d'un brun plus clair, pubescence jaune. Tête peu convexe, fortement et

<sup>2</sup> Candèze, *Compt. rend. Soc. ent. belg.* (1790), 151; *Ann. Soc. ent. belg.* (1892), 489.

<sup>3</sup> Fleutiaux, *Ann. Soc. ent. belg.* (1895), 169.

assez densément ponctuée. Antennes d'un brun noirâtre. Pronotum beaucoup plus long que large, rétréci en avant, ponctuation un peu moins forte et moins serrée que sur la tête, surtout à la base, angles postérieurs longs, bicarénés, légèrement divergents. Ecusson oblong, atténué en arrière, peu convexe, ponctué. Elytres rétrécis en arrière à partir de la moitié, tronqués au sommet, striés-ponctués, interstries granuleux. Dessous brunâtre, épipleures des élytres jaunes, pattes jaunes.

Long., 13 mm.

LUZON, Laguna, Mont Maquiling.

***Megapenthes fulvus* sp. nov.**

Allongé, subparallèle, peu convexe, jaune clair avec le milieu du pronotum à peine rembruni, pubescence jaune. Tête peu convexe, assez fortement ponctuée. Antennes d'un jaune un peu rougeâtre. Pronotum parallèle, arrondi en avant, ponctuation peu serrée mais profonde, angles postérieurs bicarénés, prolongés en arrière. Ecusson oblong. Elytres rétrécis seulement dans leur tiers postérieur, tronqués au sommet, fortement striés-ponctués, interstries granuleux. Dessous d'un jaune un peu obscur, sauf sur les propleures. Pattes jaunes.

Long., 9 mm.

LUZON, Laguna, Los Baños et Mont Maquiling.

Voisin de *M. junceus*.

***Melanoxanthus promecus* Candèze.**

Elat. nouv. (1864), 1, 36.

LUZON, Laguna, Mont Maquiling.

***Melanoxanthus bakeri* sp. nov.**

Allongé, convexe, assez brillant, noir avec le prothorax entier et une grande tache humérale sur les élytres jaunes, pubescence noire clairsemée. Tête convexe et ponctuée, faiblement caréné au milieu. Antennes courtes, noires. Pronotum jaune, convexe, à peine rétréci en avant, légèrement et éparsément ponctué, pubescence rare hérissée, noire, angles postérieurs unicarénés. Ecusson noir, oblong, sur un plan perpendiculaire, coupé carrément en arrière, éparsément ponctué. Elytres un peu plus étroits que le pronotum, faiblement atténué en arrière, tronqués au sommet, noirs avec une grande tache humérale jaune n'atteignant pas la suture, striés-ponctués assez fortement dans la première moitié, très faiblement en arrière, interstries rugueux en avant, simplement et finement pointillés dans la partie postérieure. Dessous du prothorax jaune, le reste du corps noir



et assez fortement ponctué. Pattes noirâtres avec les trochanters et l'extrémité des tarses brunâtres.

Long., 8 mm.

LUZON, Laguna, Los Baños.

Voisin de *M. exclamationis* Cand.

**Melanoxanthus affinis** sp. nov.

Oblong, convexe, atténué en arrière, noir brillant avec le pronotum rouge sauf sur le bord antérieur et l'extrémité de ses angles postérieurs, pubescence obscure. Tête convexe, arrondie en avant, couverte d'une grosse ponctuation serrée, large et peu profonde. Antennes ne dépassant pas la base du thorax, noires, larges, à articles transversaux comprimés. Pronotum un peu plus long que large, convexe, sillonné en arrière au milieu, curvilinéairement rétréci en avant, rouge avec le bord antérieur et l'extrémité des angles postérieurs noirs, ponctuation forte et serrée sur les côtés, moins grosse et moins dense sur le disque. Ecusson noir, triangulaire et granuleux. Elytres un peu plus étroits que le pronotum à la base, atténués en arrière, tronqué au sommet, fortement ponctués-striés surtout en avant, interstries rugueux dans la partie antérieure, ponctués en arrière. Dessous noir, propleures rouges. Pattes noires, extrémité des tarses brunâtres.

Long., 5.5 mm.

LUZON, Laguna, Mont Maquiling.

Voisin de *M. bicolor* Cand.

**Melanoxanthus luzonicus** sp. nov.

Elliptique, peu convexe, noir avec le thorax et les pattes jaunes; pubescence jaune, d'un jaune plus clair sur le pronotum et le propectus. Tête convexe, arrondie en avant couverte de points ombiliqués assez rapprochés. Labre et mandibules rougeâtres. Pronotum jaune, graduellement rétréci en avant, ses côtés arqués, ponctuation assez forte et serrée, angles postérieurs aigus, non divergents, carénés. Ecusson allongé, subtriangulaire. Elytres atténués en arrière, tronqués au sommet, ponctués, striés, interstries plans et rugueux. Dessous noir, propectus jaune, ponctuation peu serrée sur le prosternum, grosse et écartée sur les propleures, bien distincte et peu serrée sur les autres parties du corps. Pattes jaunes.

Long., 5 mm.

LUZON, Laguna, Los Baños.

Voisin de *M. sanguinicollis* Schw.

**Melanoxanthus ater** sp. nov.

Oblong, atténué en arrière, peu convexe, entièrement d'un noir profond peu brillant, pubescence noire. Tête convexe, arrondie en avant, ponctuation assez forte. Pronotum arrondi et rétréci en avant, sillonné au milieu à la base, ponctuation nette et peu serrée sur le disque, plus forte et plus dense sur les côtés, angles postérieurs courts, carénés. Ecusson oblong, rétréci en arrière. Elytres atténués en arrière, subtronqués au sommet, ponctués-striés, interstries rugueux. Dessous et pattes noirs.

Long., 4 mm.

LUZON, Laguna, Los Baños.

Voisin de *M. carbunculus* Cand.

**Melanoxanthus crucifer** sp. nov.

Allongé, peu convexe, jaune avec une étroite bande noire au milieu du pronotum prolongée sur les élytres tout le long de la suture et une bande transversale de même couleur au delà de la moitié des élytres. Tête peu convexe, front arrondi et saillant en avant, ponctuation forte et serrée. Antennes jaunes. Pronotum assez convexe, rétréci en avant, sillonné au milieu à la base, assez fortement et densément ponctué, angles postérieurs prolongés, arrondis au sommet, longuement carénés. Ecusson allongé, rétréci en arrière, rugueux. Elytres arrondis à l'extrémité, assez fortement ponctués-striés. Dessous et pattes entièrement jaunes.

Long., 4 mm.

LUZON, Laguna, Los Baños.

Voisin de *M. cruciellus* Cand.

**Melanoxanthus infimus** Candèze.

Compt. rend. Soc. ent. belg. (1875), 124.

LUZON, Laguna, Los Baños.

**Anchastus vittatus** sp. nov.

Elliptique, peu convexe, noir avec la base des antennes, les angles postérieurs du pronotum, une bande longitudinale au milieu de chaque élytre partant de la base, se rétrécissant en arrière et s'arrêtant avant l'extrémité, jaunes; pubescence de la couleur du fond. Tête arrondie en avant, peu convexe, ponctuée. Antennes dépassant la base du thorax. Pronotum plus long que large, rétréci en avant, ponctuation assez forte mais

écartée, plus grosse sur les côtés; angles postérieurs aigus, non divergents, sans carène distincte. Ecusson noir, oblong, rugueux. Elytres graduellement rétrécis en arrière, fortement ponctués-striés. Dessous d'un jaune rougeâtre avec la partie médiane externe des propleures et le pourtour de l'abdomen sur une assez grande largeur noirs. Pattes jaune clair.

Long., 4.5 mm.

LUZON, Laguna, Mont Maquiling.

Voisin de *A. rufangulus* Cand.

**Anchastus unicolor** Candèze.

Elat. nouv. (1881), 3, 61.

LUZON, Laguna, Los Baños.

**Hypnoidus bakeri** sp. nov.

Oblong, d'un brun noirâtre brillant, pubescence grise. Tête assez convexe, bord antérieur ferrugineux. Antennes jaunes, articles du milieu un peu obscurcis. Pronotum à peine aussi long que large à la base, rétréci en avant, assez convexe, très finement et densément pointillé; angles postérieurs jaunes, leur carène angulaire atteignant la moitié en avant. Ecusson brun, convexe, assez grand, rétréci en arrière. Elytres ornés de deux taches jaunes, une en croissant partant de l'épaule et se dirigeant vers la suture en contournant l'écusson à une certaine distance et une autre oblongue avant l'extrémité, striés très fines, non ponctuées, interstries plans. Dessous obscur, bord externe des propleures jaune, prosternum brunâtre avec sa mentonnière plus clair. Pattes jaunes.

Long., 3 mm.

LUZON, Laguna, Mont Maquiling.

**Cardiophorus bakeri** nom. nov.

*Cardiophorus elegans* CANDÈZE, Ann. Mus. Civ. Gen. (1878), 132; nec. Solier.

Décrit de Célèbes, j'en possède un exemplaire d'Amboine. J'ai dû changer le nom de Candèze qui a été employé antérieurement par Solier (1851) pour une espèce chilienne.

LUZON, Laguna, Los Baños.

**Diploconus umbilicatus** Candèze.

Compt. rend. Soc. ent. belg. (1875), 125.

LUZON, Laguna, Mont Maquiling.

**Diploconus erythronotus** Candèze.

Elat. nouv. (1864), 1, 46.

LUZON, Laguna, Mont Maquiling.

**Diploconus politus** Candèze.

Compt. rend. Soc. ent. belg. (1875), 126.

LUZON, Laguna, Los Baños, Mont Maquiling.

**Diploconus philippinensis** sp. nov.

Allongé, entièrement d'un rouge ferrugineux peu brillant, pubescence jaune. Tête convexe, fortement ponctuée, bord antérieur arrondi et rebordé. Antennes dépassant la base du thorax, ferrugineuses, premiers articles plus clairs. Pronotum plus long que large, rétréci en avant, peu convexe, régulièrement ponctué, légèrement sillonné au milieu de la base, angles postérieurs à peine divergents, bicarénés. Ecusson oblong, rugueux. Elytres atténués en arrière, arrondis et denticulés au sommet, ponctués-striés, interstries faiblement rugueux. Dessous de même couleur. Hanches postérieures nettement anguleuses et même subdentées. Pattes jaunes.

Long., 9 mm.

LUZON, Laguna, Mont. Maquiling.

Voisin de *D. politus* Candèze.**Diploconus obscurus** sp. nov.

Allongé, d'un brun noirâtre peu brillant, pubescence jaune. Tête peu convexe, à bord antérieur avancé et saillant, très fortement et densément ponctuée. Antennes d'un ferrugineux obscur. Pronotum plus long que large, rétréci en avant, peu convexe, fortement et densément ponctué, sillonné au milieu à la base au delà de la moitié, angles postérieurs peu divergents, bicarénés. Ecusson oblong, ponctué. Elytres atténués en arrière, subtronqués au sommet, ponctués-striés, interstries rugueux. Dessous de même couleur. Hanches postérieures subanguleuses. Pattes ferrugineuses.

Long., 9.5 mm.

LUZON, Laguna, Mont Maquiling.

Voisin de *D. umbilicatus* Candèze.**Diploconus bakewellii** sp. nov.

Allongé, peu convexe, d'un brun noirâtre assez brillant, pubescence rousse. Tête peu convexe bord antérieur avancé, arrondi et saillant, ponctuation forte, ombiliquée et serrée. An-

tennes ferrugineuses, dépassant la base du thorax. Pronotum plus long que large, graduellement rétréci en avant, peu convexe, ponctuation assez forte, écartée sur le disque, plus profonde et plus serrée sur les bords, angles postérieurs aigüe et bicarénés. Ecusson oblong, ponctué. Elytres graduellement rétrécis en arrière, arrondis au sommet, ponctués-striés, interstries peu rugueux. Dessous d'un brun rougeâtre clair, surtout sur l'abdomen. Hanches postérieures subanguleuses. Pattes jaunes.

Long., 6.5 mm.

LUZON, Laguna, Los Baños, Mont Maquiling.

Voisin de *D. obscurus*. Je possédais déjà un exemplaire de cette espèce provenant de la collection Janson (ex-Bakewell.)

**Melanotus ebeninus** Candèze.

Mon. Elat. (1860), 3, 305, 335. Compt. rend. Soc. belg. (1875), 126.

LUZON, Laguna, Los Baños.

Je possède un type de Candèze, dans la collection Chevrolat (ex-Cuming). Se trouve également à l'Ile Jolo (Dr. Platen).

**Melanotus scribanus** Candèze.

Elat. nouv. (1893), 5, 48.

LUZON, Laguna, Los Baños, Mont Maquiling.

**Tristilophus luzonicus** Candèze.

Elat. nouv. (1864), 1, 53. Compt. rend. Soc. ent. belg. (1875), 126.

LUZON, Laguna, Mont Maquiling.

C'est seulement dans son Catalogue Méthodique des Elaterides <sup>4</sup> que Candèze a placé cette espèce dans le genre *Tristilophus*, correspondant à la section IV du genre *Corymbites*, dans sa Monographie des Elaterides.<sup>5</sup>

**Ludius hirsutus** Candèze.

Compt. rend. Soc. ent. belg. (1875), 126.

LUZON, Laguna, Mont Maquiling.

Malgré la coloration uniformément d'un brun noirâtre, de l'unique individu que j'ai sous les yeux, je ne crois pas devoir le séparer de cette espèce.

<sup>4</sup>(1891), 175.

<sup>5</sup>(1863), 4, 85, 123.

**Glyphonyx erraticus** Candèze.\*

Compt. rend. Soc. ent. belg. (1875), 127.

LUZON, Laguna, Los Baños.

L'exemplaire de M. Baker répond à la variété citée par Candèze.

**Glyphonyx posticus** (?) Candèze.

Compt. rend. Soc. ent. belg. (1875), 127.

LUZON, Laguna, Mont Maquiling.

Un seul exemplaire chez lequel la pubescence est unicolore sur toute la surface.

**Hemiops semperi** Candèze.

Elat. nouv. (1878), 2, 53.

LUZON, Laguna, Los Baños.

**Dicronychus bakeri** sp. nov.

Subcylindrique, convexe, entièrement jaune, pubescence peu visible. Tête abaissée et impressionnée en avant, bord antérieur arrondi et rebordé, ponctuation grosse et serrée. Antennes épaisses, dépassant la base du thorax, d'un jaune obscur. Pronotum subparallèle, ponctuation forte, moins serrée que sur la tête, angles postérieurs courts et divergents. Ecusson subarrondi, irrégulièrement ponctué. Elytres parallèles, arrondis au sommet, très rugueux, fortement striés. Dessous de la même couleur. Cuisses plus clairs.

Long., 7.5 mm.

LUZON, Laguna, Los Baños, Mont Maquiling.

Voisin de *D. cinnamomeus* Candèze.

\* Je ne crois pas que la variété *attonitus* Cand., *Elat. nouv.* (1896), 6, 78, de Palawan puisse être rapportée à cette espèce.



# CATALOGUE DES PSÉLAPHIDES (COLÉOPTÈRES) DES ILES PHILIPPINES <sup>1</sup>

Par A. RAFFRAY  
(*Roma, Italia*)

M. le Professeur C. F. Baker a bien voulu me communiquer quelques Psélaphides qu'il avait recueillis à Los Baños et parmi lesquels il y avait plusieurs espèces nouvelles.

Bien que le nombre des Psélaphides connus de l'Archipel des Philippines ne représente qu'une très minime partie des espèces qui habitent certainement cette région intertropicale, j'ai pensé qu'il y avait intérêt à donner la liste de toutes les espèces connues jusqu'à ce jour et que cela pourrait encourager des recherches ultérieures.

C'est en 1890 que mon ami M. Eugène Simon fit un voyage aux Philippines d'où il rapporta 12 espèces de Psélaphides qui s'augmentèrent de 5 autres espèces de la collection Baer et d'une autre décrite déjà par Reitter, se qui me donna l'occasion de publier un premier travail sur les Psélaphides des îles Philippines.<sup>2</sup>

## ***Intempus punctatissimus* Reitter.**

*Intempus punctatissimus* REITTER, Deutsch. Ent. Zeitschr. (1885), 337, Pl. III, fig. 27. Manila.

## ***Thesiastes crassipes* Raffray.**

*Euplectus crassipes* RAFFRAY, Ann. Soc. ent. France (1891), 475. Bulacan.

## ***Batrisodes cavicola* Raffray.**

*Batrisus cavicola* RAFFRAY, Ann. Soc. ent. France (1891), 476, Pl. 14, fig. 1. Cueva de San Mateo (Montalvan), province de Manila.

## ***Batrisodes verticinus* Raffray.**

*Batrisus verticinus* RAFFRAY, Ann. Soc. ent. France (1891), 477. Cueva de San-Mateo (Montalvan), province de Manila.

## ***Batrisocenus tumidipes* Raffray.**

*Batrisodes tumidipes* RAFFRAY, Ann. Soc. ent. France (1891), 479, Pl. 14, fig. 4. Manila.

<sup>1</sup> Proof read by C. F. Baker.

<sup>2</sup> Ann. Soc. ent. France (1891), 473, Pl. 14.



**Batrisocenus hamatipes** Raffray.

*Batrisodes hamatipes* RAFFRAY, Ann. Soc. ent. France (1891), 480, Pl. 14, fig. 5. Manila.

**Batrisocenus clavipes** Raffray.

*Batrisodes clavipes* RAFFRAY, Ann. Soc. ent. France (1891), 480, Pl. 14, fig. 3. Manila.

**Batrisocenus squamiceps** Raffray.

*Batrisodes squamiceps* RAFFRAY, Ann. Soc. ent. France (1911), 478, Pl. 14, fig. 2. Manila.

**Batraxis pubescens** sp. nov.

Oblonga, subparallela, convexa, tota rufa, setis erectis sed sparsis vestitus. Caput magnum, transversum, antice vix attenuatum; fronte subrecte truncata, angulis anticis integris, sulco transverso integro et juxta oculos fovea obliqua; temporibus rotundatis. Antenna mediocres, articulis 1 et 2 majoribus, 1 cylindrico, 2 obconico, 3 obconico, latitudine sua longiore, 4-8 monilibus, 9 cylindrico, latitudine sua paululum longiore, 10 magno, transverso, 11 maximo, latere interno recto, latere externo obliquo, basi rotundato, apice parum acuminato. Prothorax capite vix angustior, transversus, ad basin attenuatus, angulis anticis obtusis, lateribus obliquis; fovea antebasali minuta. Elytra subquadrata, lateribus rotundatis, humeris obtuse carinatis; stria suturali integra, dorsali nulla. Abdomen elytris æquilongum, lateribus rectis, postice rotundatum; segmento primo magno, cujus margine laterali vix perspicue carinata; basi carinulis duabus brevibus et circa quartam partem disci includentibus. Pedes validi, sat elongati; femoribus sat crassis; tibiis subrectis ad apicem incrassatis.

Long., 1.40 mm.

LUZON, Laguna, Los Baños (C. F. Baker).

Cette espèce est excessivement voisine de *Batraxis hirtella* Raffray de Nouvelle-Guinée occidentale; elle en diffère par la tête encore plus grosse, avec les angles antérieurs non entaillés, les antennes plus longues, moins épaisses, dont le 2<sup>e</sup> article est plus allongé, le prothorax plus gibbeux sur le disque en avant, avec les angles antérieurs plus marqués.

**Batraxis nitidula** sp. nov.

Oblonga, antrorsum attenuata, convexa, rufotestacea, nitida, glabra, antennis leviter pubescentibus. Caput quadratum; fronte medio antrorsum declivi, utrinque in angulis quadratis elevata, transversim sulcata; inter oculos magnos, prominentes,

antice sitos, foveis duabus validis; temporibus obliquis et leviter arcuatis. Antennæ validæ, crassæ, articulis duobus primis paulo majoribus, 3-7 subobconicis, longitudine decrescentibus, 8 ovato, 9 fere globoso, 10 magno, trapezoidali, transverso, 11 maximo, triangulari, latere externo obliquo et sulcato, apice leviter acuminato. Prothorax capite et longitudine sua parum lator, breviter cordatus, angulis anticis rotundatis lateribus ad basin obliquis; fovea antebasali minutissima. Elytra leviter transversa, ad basin leviter attenuata; humeris obliquis et obtuse carinatis; lateribus leviter rotundatis; margine postica trisinuata; basi bifoveata, stria dorsali nulla. Abdomen elytris æquilongum, lateribus subparallelum, postice obtusum; segmento 1<sup>o</sup> magno; margine laterali bicarinata, carina interna valde obliqua et externa maxime approximata; basi utrinque foveato, medio transversim impresso et ciliato inter carinulas duas breves, plus quam tertiam partem disci includentes. Pedes validi et elongati; femoribus medio incrassatis; tibiis ad apicem paululum incrassatis, posticis leviter incurvis; trochanteribus anticis obtuse angulatis.

Long., 1.70 mm.

LUZON, Laguna, Los Baños (*C. F. Baker*).

Cette espèce, par l'absence de toute pubescence sur le corps, est très différente de la précédente. Elle établit une transition entre le groupe IX qui a les carénules abdominales distantes de  $\frac{1}{2}$  et le groupe X qui les a distantes de  $\frac{1}{2}$  ou  $\frac{3}{8}$ ; dans *B. nitidula* ces carénules sont distantes seulement d'un peu plus de  $\frac{1}{2}$ .<sup>2</sup> Voisine de *sinensis* Raffr. de Tientsin (Chine); elle en diffère par les carénules abdominales beaucoup plus courtes, les élytres plus fortement sinués à l'extrémité, le dernier article des antennes notablement moins long et plus épais.

*Reichenbachia rufa* Schmidt-Göebel.

*Reichenbachia rufa* SCHMIDT-GÖEBEL, Beitr. Mon. Psél. ( ), 6, Pl. I, fig. 4. Manila. (Inde, Ceylon, Java, Singapore, Celebes, Siam, Annam, Syrie.)

*Reichenbachia manillensis* Raffray.

*Bryaxis manillensis* RAFFRAY, Ann. Soc. ent. France (1891), 490, Pl. 14, fig. 14 et 14a. Antipolo, province de Morong.

*Reichenbachia laticollis* Raffray.

*Bryaxis laticollis* RAFFRAY, Ann. Soc. ent. France (1891), 491, Pl. 14, fig. 15 et 15a. Antipolo, province de Morong.

<sup>2</sup> *Ann. Soc. ent. France* (1904), 117, 199.

**Reichenbachia dama** Raffray.

*Bryaxis dama* RAFFRAY, Ann. Soc. ent. France (1891), 492, Pl. 14, fig. 17. Quingua, province de Bulacan.

**Anasis lævicollis** Raffray.

*Bryaxis lævicollis* RAFFRAY, Ann. Soc. ent. France (1891), 493. Manila.

**Rybaxis gladiator** Raffray.

*Rybaxis gladiator* RAFFRAY, Ann. Soc. ent. France (1891), 481, Pl. 14, fig. 7. Manila et Antipolo.

**Rybaxis simoniana** Raffray.

*Rybaxis simoniana* RAFFRAY, Ann. Soc. ent. France (1891), 482. Antipolo.

**Tyraphus baeri** Raffray.

*Tyraphus baeri* RAFFRAY, Ann. Soc. ent. France (1891), 493.

LUZON, Laguna, Los Baños (C. F. Baker).

**Centrophthalmus philippinensis** sp. nov.

Oblongus, antice attenuatus, rubrocastaneus, nitidus, longe brunneo-hirsutus. Caput triangulare; tuberculo antennario angusto, sulcato; inter oculos foveis duabus magnis; spina infra-oculari deficiente; temporibus dense et longe ciliatis. Oculi magni, prominentes. Palporum articulo 3 elongato-triangulari, apice recte truncato, 4 minuto, subulato. Antennæ validæ, crassæ, clava quadriarticulata, articulis 1 cylindrico, 2 quadrato, 3-7 minoribus, quadratis, 8-10 majoribus, latitudine sua longioribus, 8 cylindrico, 9 et 10 ovatis, 11 magno, ovato. Prothorax capite major, latitudine sua paululum longior, antice plus et postice vix attenuatus, lateribus ad basin subrectis; fovea antebasali magna. Elytra leviter transversa, ad basin attenuata; humeris rotundatis sed obtuse notatis; basi bifoveata, sulco dorsali parum profundo, obliquo, ante medium evanescente. Abdomen elytris paulo longius; segmento 1° secundo paulo minore, carinis duabus plus quam dimidiam partem disci includentibus, in primo segmento integris, in secundo tantum modo basi brevissimis. Pedes validi, elongati; femoribus, præsertim anticis, crassis; tarsis anticis extus medio inflatis, intermediis et posticis subrectis.

Long., 2.60 mm.

LUZON, Laguna, Los Baños (C. F. Baker.)

Voisin de *Centrophthalmus clavatus* Raffray des Nilghiri (India) par l'absence d'épine infraoculaire qui est réduite à un très petit tubercule mousse; elle en diffère par les téguments lisses sur les élytres dépourvus d'aspérités sétifères; les articles

8, 9 et 10 des antennes sont plus longs que larges, au lieu d'être transversaux comme dans *C. clavatus*; les carénules abdominales sont beaucoup plus courtes sur le 2<sup>e</sup> segment et bien moins distantes entre elles; le prothorax aussi est différent, rétréci tout à fait en avant, avec les côtés ensuite presque droits jusqu'à la base qui est à peine rétrécie.

*Raphitreus bakeri* sp. nov.

Oblongus, antice attenuatus, castaneus, palpis tarsisque testaceis, sat dense sed tenuiter pallide pubescens. Caput latitudine sua longius, antice attenuatum, postice rotundatum; tuberculo antennario magno, basi coarctato, profunde sulcato, in vertice foveis duabus; genis canthum infraocularem formantibus, longe ciliatis. Oculi maximi, prominentes. Palporum articulis 2 apice incrassato et angulato, 3 triangulari, 4 elongato, apice valde acuminato, latere externo ad basin angulato, 2, 3 et 4 longe uniappendiculatis. Antennæ elongatæ et crassæ, articulis 1<sup>o</sup> cylindrico, 2 subovato, 3-8 minoribus et leviter transversis, clava magna, triarticulata, 10 transverso, 11 breviter ovato, basi truncato. Prothorax capite multo major, cordatus, convexus, latitudine sua paulo longior; foveis tribus liberis, lateralibus majoribus antebasali oblonga. Elytra transversa, subdeplanata, ad basin leviter attenuata, humeris rotundatis sed obtuse elevatis, basi bifoveata, stria dorsali medio abbreviata. Abdomen elytris majus, segmentis dorsalibus 1 utrinque toto carinato, 2 dimidio longiore, basi utrinque brevissime carinato. Pedes validi; femoribus incrassatis; tibiis anticis leviter incurvis, medio extus inflatis, intermediis ante apicem leviter sinuatis, posticis vix incurvis.

♂ : Antennarum clava majore, articulo 9 obconico, latitudine sua paululum longiore. Metasternum impressum.

♀ : Antennarum clava minore, articulo 9 subquadrato. Metasternum simplex.

Long., 2 mm.

LUZON, Laguna, Los Baños (*C. F. Baker*).

Cette espèce diffère de *R. speratus* Sharp du Japon et de *R. dentimanus* Raffr. de l'Annam, Tonkin et Singapore, par l'absence totale de ponctuation. Je suis très heureux de dédier cette espèce à Monsieur C. F. Baker qui l'a découverte.

*Dacnotillus simoni* Raffray.

*Tmesiphorus simoni* RAFFRAY, Ann. Soc. ent. France (1891), 495.  
Cueva de San Mateo (Montalvan).



## NEW PHILIPPINE HYMENOPTERA <sup>1</sup>

By J. C. CRAWFORD  
(Washington, D. C.)

### CHALCIDIDÆ

*Leucospis pulchellus* sp. nov.

*Female*.—Length, 7 mm. Black, the first 3 abdominal segments red; spot on front of scape, transverse band on anterior edge of pronotum and 1 near posterior margin, a small spot on middle of propodeum at apex, a line on middle of metapleuræ, a small spot on each side of first abdominal segment, a line on each side of third segment, a line on anterior tibiæ outwardly, middle tibiæ except narrow brown stripe inwardly, a line on upper outer margin of hind femora which at base extends downward to first tooth on lower margin, a line on hind tibiæ outwardly, and on first 2 joints of hind tarsi, ivory yellow; face finely vertically rugulose, above antennal fossa more coarsely transversely rugulose; on each side of face a swelling just below upper end of antennal fossa; pro- and mesonotum closely coarsely punctured, punctures on mesoscutum arranged so that the interspaces in places form indistinct transverse rugæ; metanotum, propodeum, and pleuræ with punctures similar to those on mesonotum; propodeum with median and lateral longitudinal carinæ; wings dark brown; lower margins of hind femora with a tooth followed apicad by 2 or 3 much longer ones, then several smaller semifused teeth; abdomen closely punctured, the punctures on the first segment sparse, separated from each other by about two or more times a puncture width; ovipositor reaching almost to base of third abdominal segment, the groove for its reception not quite reaching base of segment; the second abdominal segment medially longitudinally carinate, the first segment toward apex exceedingly indistinctly carinate, being more angulate than carinate.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (C. F. Baker). Type No. 18401, United States National Museum.

*Leucospis bakeri* sp. nov.

*Female*.—Length, about 7 mm. Black, with red and yellow markings, the ovipositor not reaching the base of the third ab-

<sup>1</sup> Proof read by C. F. Baker.

dominal segment, the apical two-thirds of which is deeply furrowed for its reception; head, thorax, and abdomen coarsely rugoso-punctate, the head black, the antennæ ferruginous, dusky above, the scape yellow; pronotum with 2 broad yellow stripes, the anterior margin reddish, the 2 yellow stripes separated by a black stripe bordered with reddish; posterior margin almost hyaline, slightly tinged with reddish; pronotum with 2 transverse carinæ, the anterior one short, at about the middle of the black stripe, the posterior one at the middle of the posterior yellow stripe and extending to the lateral margins; mesonotum black with the lateral margins yellow, and a large subquadrate reddish spot on the disk extending to the apex of the scutum; anteriorly the corners of this reddish spot are yellow; scutellum with the apical margin narrowly reddish and just cephalad of this a transverse yellow mark; somewhat U-shaped; metanotum with a semicircular carinated medial elevation, this apically with a median depressed area, carinated at sides, elevation projecting over propodeum slightly at middle; metanotum medially reddish and with a median yellow spot; propodeum coarsely punctured and with a median longitudinal carina; wings infuscated, more so along anterior margins, near apex with a darker spot; tegulæ and propectus reddish; metapleuræ yellow; coxæ black, the mid ones yellowish anteriorly at apex; hind coxæ with a large yellow basal spot above and 1 below at apex; fore and mid femora black, with the apical part yellow, their tibiæ yellow each with a brown stripe behind, that on the mid tibiæ small; hind femora outwardly black with the upper margin yellow and a large yellow spot below at base; lower margin with a large triangular tooth near middle and distad of this about 6 small teeth; first abdominal segment with 2 large yellow spots, second segment transverse, yellow except apical margin, third segment near middle with a yellow band which laterally widens posteriorly and reaches the apical margin of segment; fourth segment with 2 small spots, fifth with 2 larger spots, first, second, and third segments basad of the furrow for the ovipositor with a median longitudinal carina.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18402, United States National Museum.

*Pareniaca browni* sp. nov.

*Female*.—Length, about 3.5 mm. Black, the head and thorax coarsely rugoso-punctate, the antennæ and fore and mid legs, except coxæ, ferruginous; antennæ dusky at tips; hind legs, ex-

cept the whitish tarsi, black; first joint of funicle slightly longer than second, the pedicel about as long as these combined; wings almost hyaline, very faintly dusky; first segment of abdomen longer than broad, with 4 dorsal carinæ, second segment with 4 basal carinæ, these not as long as the first segment and extending less than one-sixth the length of the segment, second segment near apex with a punctured area on each side; following segments punctured at the sides.

*Male*.—Length, about 3 mm. Similar in color and structure to the female, but the first joint of the funicle shorter than the second; wings slightly more dusky than in the female; the petiole longer and more slender, the 4 dorsal carinæ more prominent; second segment with about 7 or 8 short carinæ.

LUZON, Manila (*R. E. Brown, S. J.*). Type No. 18403, United States National Museum.

*Pareniaca bakeri* sp. nov.

*Female*.—Length, about 3 mm. Black, the head and thorax coarsely rugoso-punctate; antennæ brown, the first joint of funicle slightly longer than broad, the pedicel slightly longer than first and second joints of funicle combined; wings hyaline, slightly whitish; fore and mid legs dark brown, the femora lighter at bases and the tibiæ lighter at apices, their tarsi testaceous; hind legs, except the testaceous tarsi, black; first segment of abdomen transverse, with 4 dorsal carinæ; second segment with 8 or 9 carinæ which are about three times as long as first segment, but not reaching middle of the segment; second segment with a punctured area near apex on each side; following segments with similar small areas.

*Male*.—Unknown.

LUZON, Manila (*R. E. Brown, S. J.*). Type No. 18404, United States National Museum.

The type and one paratopotype were collected by R. E. Brown, S. J.; two paratypes from Los Baños were collected by Prof. C. F. Baker, after whom the species is named.

#### PERILAMPIDÆ

*Perilampus luzonensis* sp. nov.

*Female*.—Length, 5 mm. Green, face with a strong carina extending down to level of insertion of antennæ, the space between the carina and the eyes coarsely punctured, sides of face below coarsely punctured, inner margins of parapsidal areas with a broad smooth band; scutellum slightly longer than mesoscutum,



the apex very slightly emarginate; legs green, the tarsi whitish testaceous; abdomen smooth, sides of the second segment very finely indistinctly punctured.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18405, United States National Museum.

*Perilampus punctiventris* sp. nov.

*Male*.—Length, about 3.5 mm. Head and thorax obscurely greenish, the middle lobe of mesonotum almost black, the abdomen black; face with a carina on each side which meet back of anterior ocellus; in front of the lateral ocelli and centrad of the carinæ along their upper ends a few fine punctures; between the ocelli the surface rugose, back of them transversely so; mesoscutum including outer part of parapsidal areas coarsely rugoso-punctate; broad inner part of parapsidal areas smooth, polished, posteriorly this area with a few fine wrinkles and along the inner margin a row of large shallow punctures; wings hyaline; legs green, the tarsi testaceous; abdomen with the first segment, except basally and a broad apical margin, closely, finely punctured; second segment at base with similar punctures.

*Female*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18406, United States National Museum.

The punctures on the abdomen distinguish this species.

#### PTEROMALIDÆ

*Cercocephala bakeri* sp. nov.

*Female*.—Length, about 1 mm. Head and thorax light reddish-brown with a slight metallic sheen; abdomen almost black, with æneous and purple reflections; antennæ testaceous, the last 2 joints of the funicle and the club dark brown; funicle 6-jointed, the first joint quadrate; pedicel as long as first 2 joints of funicle combined; entire insect, except the finely rugulose propodeum, smooth and polished; wings with a distinct violaceous luster, beyond the base of the marginal vein slightly infuscated; stigmated spot on submarginal vein with a tuft of dark hairs; legs testaceous; sheaths of ovipositor exposed about one-fourth the length of abdomen, whitish, with dark tips.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18407, United States National Museum.

Described from 4 specimens reared by Professor Baker from bark containing borers. This species differs from the de-

scribed species of the genus *Cercocephala* except *elegans* by having a tuft of dark hairs on the stigmated spot on the submarginal vein, and from *C. (Chætosipila) elegans* Westwood in having 6 joints in the funicle.

### ELASMIDÆ

*Elasmus elegans* sp. nov.

*Female*.—Length, about 2.25 mm. Head and thorax blue-green; abdomen elongate, somewhat longer than head and thorax combined, brown, with the basal third both above and below reddish, and with the extreme base above green; face with large, scattered punctures, those laterad of the antennal fossa arranged in 2 vertical rows; antennæ long, scape whitish, rest of antennæ brown, segments of funicle almost subequal in length, the first indistinctly longer than the pedicel, the last fully twice as long as widest diameter, and about two-thirds as long as club; mesoscutum rather closely punctured, each puncture having a dark-colored hair; scutellum finely and indistinctly reticulated; metanotum yellow, with a hyaline border; wings slightly dusky; hairs on legs black; fore legs, including coxæ, whitish, the coxæ beneath with 4 long setæ; tibiæ with longitudinal rows of hairs; mid coxæ and femora, except their apices, black; rest of mid legs whitish, the tibiæ and basal joints of tarsi with longitudinal rows of hairs; basal half of hind coxæ and apical half of hind femora almost black, rest of hind legs whitish; the tibiæ behind with rows of hairs arranged in diamond-shaped figures; basal joints of hind tarsi with longitudinal rows of hairs.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18408, United States National Museum.

This species resembles *E. philippinensis* Ashmead, but that species is much smaller, has the joints of the funicle much shorter, the hind coxæ except extreme apices dark, the hind femora entirely dark, etc.

*Elasmus lutens* sp. nov.

*Female*.—Length, about 2.25 mm. Yellow; ocellar triangle, a large triangular spot on rear of head extending from top of eyes almost to their bases and connected along carinate edge of occiput with ocellar spot, the axillæ, a small spot on side of propodeum, a large spot covering the upper part of hind coxæ, spots on the sides of abdominal segments at apices, all brown; toward apex of abdomen the spots become larger so

that the last 2 segments are almost entirely brown; rest of the dorsal surface of abdomen light brownish; face with large scattered punctures; antennæ brown, the scape yellowish white, its apex brown, the first joint of funicle slightly longer than pedicel; mesopleuræ centrally dark brown, shading off into lighter above and below; bristles on hind tibiæ arranged in diamonds.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18409, United States National Museum.

*Elasmus ashmeadi* sp. nov.

Length, about 1.5 mm. Yellow; the head above insertion of antennæ, pronotum medially, a narrow stripe on middle of mesoscutum widening caudad, scutellum, propodeum, base of abdomen, and spot on hind coxæ above, green; head with large scattered punctures; antennæ brown, the scape whitish, the first joint of the funicle longer than the pedicel; triangular plate on metanotum yellow at base, rest of the plate hyaline; mesopleuræ largely brownish; legs, including coxæ, yellowish white, the bristles on the hind tibiæ arranged in diamonds.

LUZON, Manila (*R. E. Brown, S. J.*). Type and only specimen No. 18410, United States National Museum.

### EULOPHIDÆ

*Entedon magnus* sp. nov.

*Female*.—Length, about 3.25 mm. Head and thorax bronzy, the propodeum and abdomen at base bluish green, rest of abdomen æneous; head and thorax coarsely reticulately rugose, on rear of head finer and more shallow, on middle of mesoscutum at rear coarser; antennæ brown, scape whitish, first joint of funicle twice as long as pedicel, second joint slightly longer than pedicel; propodeum smooth, shiny, with a median carina, on each side of which is a narrow depression running to the short neck; lateral grooves on propodeum with cross carinæ, the grooves somewhat resembling a chain of pits; coxæ æneous, femora and basal half of tibiæ brown, the knees, apical halves of tibiæ, and tarsi, except apical joint, whitish.

*Male*.—Unknown.

LUZON, Laguna, Los Baños and Mount Maquiling (*C. F. Baker*). Type, from Los Baños, No. 18411, United States National Museum.

Described from 4 females from the type locality and 1 from

Mount Maquiling; 2 of the paratopotypes and the specimen from Mount Maquiling have the sculpture at rear of mesoscutum no coarser than the other.

*Entedon manilensis* sp. nov.

*Female*.—Length, about 2 mm. Green, more brilliantly so on propodeum and base of abdomen; apical margin of third adominal segment and beyond, purple; head and thorax coarsely reticulately rugose, sculpture on rear of head much finer; antennæ brown, pedicel and base of funicle slightly greenish, the scape, except apex, whitish, first joint of funicle about one and one-half times as long as pedicel, second joint of funicle slightly longer than pedicel, the club about as long as first joint of funicle; propodeum smooth, shiny with a median carina reaching the short neck, lateral furrows with cross carinæ; a short spine on each side of propodeum back of the spiracle; coxæ aëneous, femora, except tips, brown, tibiæ and tarsi whitish, tibiæ near base with brown annulus, that on anterior tibiæ occupying about half the tibiæ, on mid and hind tibiæ not reaching beyond basal third.

*Male*.—Unknown.

LUZON, Manila (*R. E. Brown, S. J.*). Type No. 18412, United States National Museum.

This species resembles *E. magnus*, but is much smaller, the first joint of the funicle, is shorter, and tibiæ have a narrow brown annulus instead of the basal half or more being brown.

*Euplectrus flavescens* sp. nov.

*Female*.—Length, 2.5 mm. Yellow; middle lobe of mesoscutum, middle of scutellum, sides of axillæ and of metanotum, most of propodeum and pleuræ reddish honey color; the abdomen more or less suffused with the same color; antennæ brown, the scape and pedicel testaceous; joints of the funicle elongate, the first over twice as long as the pedicel, the club not longer than the last joint of funicle; pronotum and mesonotum irregularly rugose; the rugæ on scutellum finer than on mesoscutum, scutellum at base with 2 large foveæ; metanotum with a median longitudinal carina and on each side of it about 2 similar but indistinct carinæ, the apical margin subcarinate; basal lip of propodeum strongly produced; propodeum with a median and lateral carina, being areolated; legs yellow, the hind coxæ slightly tinged with reddish, first joint of hind tarsi almost one and one-half times as long as second joint; longer spur

of hind tibia reaching to apex of second joint of tarsi, the shorter spur about three-fourths as long as first joint.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18413, United States National Museum.

The complete areolation of the propodeum distinguishes this from the other species of the Oriental Region in which yellow is the predominating color.

*Euplectrus rugosus* sp. nov.

*Female*.—Length, about 2.5 mm. Black, the coxæ dark brown, the femora reddish honey color, rest of legs testaceous; antennæ light brown, the scape whitish, joints of the funicle elongate, the first almost twice as long as pedicel, the club slightly longer than last joint of funicle; pronotum and mesoscutum finely rugulose, the axillæ finely reticulately lineolate, the scutellum coarsely irregularly reticulately rugose, the apical margin subcarinate, metanotum with a short median carina extending caudad about half the length of metanotum then dividing and each branch extending laterad then caudad again, making a median apical fovea; propodeum with a median carina, the basal lip not very strongly produced; first joint of hind tarsi not quite one and one-half times as long as second, longer spur of hind tibiæ reaching almost to apex of second tarsal joint, shorter spur reaching about to base of apical fourth of first joint of tarsi.

*Male*.—Unknown.

LUZON, Laguna, Los Baños (*C. F. Baker*). Type No. 18414, United States National Museum.

This species resembles *E. bussyi* Crawford from Sumatra, but in that species the metanotum is smooth, the sculpture of the middle lobe of the mesoscutum is similar to, and almost as strong as, the sculpture of the scutellum, being in both cases reticulately rugose, whereas in *E. rugosus* the sculpture of the middle lobe of the mesoscutum is much finer and of a different type than that on the scutellum.

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## THE IGOROTS OF LEPANTO

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Nine plates and 1 text figure

### INTRODUCTION

In order that local historical data regarding the Philippine Islands, which exist only in scattered manuscripts or in oral tradition, might be preserved, the Governor-General of the Philippines, under date of January 26, 1911, directed each provincial governor to "issue instructions to each *municipal presidente* to call together the old men in each and every *barrio*, *sitio*, or *arrabal* in his municipality<sup>1</sup> and obtain from them and from any documents in their possession the entire history of such community, in so far as may be possible." Each report was to embody, among other things, the present official name of the

<sup>1</sup> In Spanish times, each province was divided into units termed *pueblos*. The present units of the provinces are called municipalities or townships—the latter name being used in Mountain Province. Each of these divisions is presided over by an official known as the president or *presidente*. He is assisted by a vice-president or *vice-presidente*, by a secretary and treasurer or secretary-treasurer, and by a body of councilors or *concejales*. Each municipality or township consists of a number of small communities, known as *barrios*. The *barrio* may be likened somewhat to the ward of a city, except that many *barrios* are compact communities distantly separated from the rest of the larger unit. The chief official of the *barrio* is termed lieutenant or *teniente*. Many *barrios* are in turn divided into small districts called *sitios*, although this term has no legal significance. *Arrabal* is a term used to designate the suburbs of a large town. It is used at times in the Philippines to denote a section of the municipality, and is itself divided into *barrios*. The terms *comandancia* and *distrito* relate to military not civil government. See Census of the Philippine Islands. Washington (1905), 1, 57-59.

barrio or other division, its native name and meaning, date of its establishment, the original families, lists of officials, old stories or legends, and the history of any old abandoned barrios or other divisions. The material was to be forwarded to the Executive Secretary of the Philippine Government and by him to be deposited in the Philippine Library—a Government institution which bears the same relation to the Philippine Islands as the Library of Congress does to the United States.

Of course, it is recognized that some of the material gathered in this way is apt to be wrong, misleading, or fragmentary. Much of it can, however, be checked by known written history, while often one manuscript will check or correct another, and frequently common sense will act as the best guide as to what is to be received and what rejected. On the other hand, many little points that have entirely escaped writers may be preserved. The generation from which this material was obtained is rapidly passing away, and the new generation that is taking its place is losing, almost insensibly, a part of the storied traditions.

A considerable number of the 38 provinces have already complied fully with the order, and about 600 manuscripts of varying degrees of excellence have been added to the library. Some are written in the native languages, some in Spanish, and some in English. Many of those written in languages other than English are accompanied by English translations. Among the manuscripts are those for Lepanto subprovince, a part of Mountain Province of northern Luzon.<sup>2</sup> These were gathered under the

<sup>2</sup>The evolution of the present Mountain Province is interesting, and may be followed in various Acts of the Philippine Commission. During the latter part of the Spanish régime, the 7 subprovinces now composing Mountain Province were known as *distritos* or *comandancias*, or formed part of another province. Act No. 410, enacted May 28, 1902, provided for the organization of a provincial government in the territory comprised in the *comandancias* of Lepanto, Bontoc, and Amburayan, and the territory lying between Abra, Cagayan, and Bontoc not included within the limits of any province, and providing for justices of the peace in this territory and in Nueva Vizcaya Province [Public Laws. Manila (1903), 1, 970-972]. The new province was called Lepanto-Bontoc. Bontoc subprovince contained certain lands not before assigned. The other two subprovinces followed closely the limits of the former *comandancias*. Act No. 411, enacted on the same date as the above [Public Laws (1903), 1, 972], provided for the establishment of civil governments in the townships and settlements of the province. Act No. 768, Manila, 1904, enacted May 26, 1903 [Public Laws (1904), 2, 422, 423], fixed the boundary lines between Amburayan and Lepanto subprovinces and Benguet Province. Act No. 867, enacted September 5, 1903 [Public Laws. Manila (1905), 3], declared the Mountain Judicial District to consist of the Provinces of

supervision of Mr. W. A. Miller, formerly lieutenant-governor of Lepanto. The various manuscripts were all written in the Ilocano language, with the exception of that for Mancayan, generally by the presidente or secretary of the township, at the dictation of the old men, and all were translated into English, evidently by a Filipino in the office of the subprovince in Cervantes. There are reports for all the 12 townships of the subprovince; namely, Ampusungan, Angaki, Bagnen, Banaao, Bauco, Besao, Cayan, Cervantes, Concepcion, Mancayan, Sabangan, and San Emilio. "The material for Bauco," says Beyer, "is quite accurately written, and is more valuable than all that precedes it." The people of Lepanto belong in general to the wild Malayan tribe called Igorots, who are of the same stock as those of the adjoining Benguet subprovince.<sup>3</sup> In as much as the

Lepanto-Bontoc, Benguet, and Nueva Vizcaya. Act No. 926, enacted October 7, 1903 [Public Laws (1905), 3, 62-77], extended land laws already enacted for other provinces to Lepanto-Bontoc. Act No. 955, enacted October 23, 1903 [Public Laws (1905), 3, 110-111], provided a method of taxation, in accordance with Act No. 387 [Public Laws (1903), 1, 914-915]. Act No. 1396, enacted September 14, 1905 [Public Laws (1907), 5], provided for the organization of provincial governments in all the provinces of the Islands, other than Moro Province. All parts of Acts Nos. 387, 410, and 566, at variance with this Act, were repealed. The capital of Lepanto-Bontoc was declared to be at Cervantes. Act No. 1397, enacted September 14, 1905 [Public Laws (1907), 5], provided for the establishment of local civil government among non-Christians. The subject of taxation received considerable attention in the above Act. By Act No. 1642 [Public Laws (1908), 6] the subprovinces of Kalinga and Apayao were established and boundaries fixed. Act No. 1876, enacted August 18, 1908 [Public Laws (1910), 7, 131-134], created Mountain Province, with the 7 subprovinces of Benguet, Amburayan, Lepanto, Bontoc, Ifugao (formerly comandancia of Quiangan) Kalinga, and Apayao. The boundaries of Lepanto are still somewhat vague. The Spaniards located it between 16° 45' and 17° 15' north latitude, and between 124° 10' and 124° 45' of longitude east of Madrid. Each of the 7 subprovinces is governed by a lieutenant-governor. Legislation for the province pertains to the Philippine Commission alone.

<sup>3</sup> Since early Spanish days, much confusion has existed regarding the Igorots, and the term Igorot, which simply means hillmen, has been used to designate several distinct peoples. The confusion has been marked with regard to the inhabitants of the districts (now subprovinces) of Benguet and Lepanto who are apparently of one stock, and those of Bontoc who differ from the former. Beyer [*This Journal*, Sec. D (1913), 8, 95] says definitely: "The Bontoks are sometimes wrongly called Igorots, but have no more right to that name than have the Ifugaos. They are a distinct people, occupying a part of the subprovince of Bontok." No adequate classification of the tribes of northern Luzon has yet been adopted, although Worcester has done considerable in clearing up old confusions. A classification based on dialect might perhaps answer all requirements. Worcester [*This Journal* (1906), 1, 834] says: "The line between the territory of the Bontoc *Igorots* and



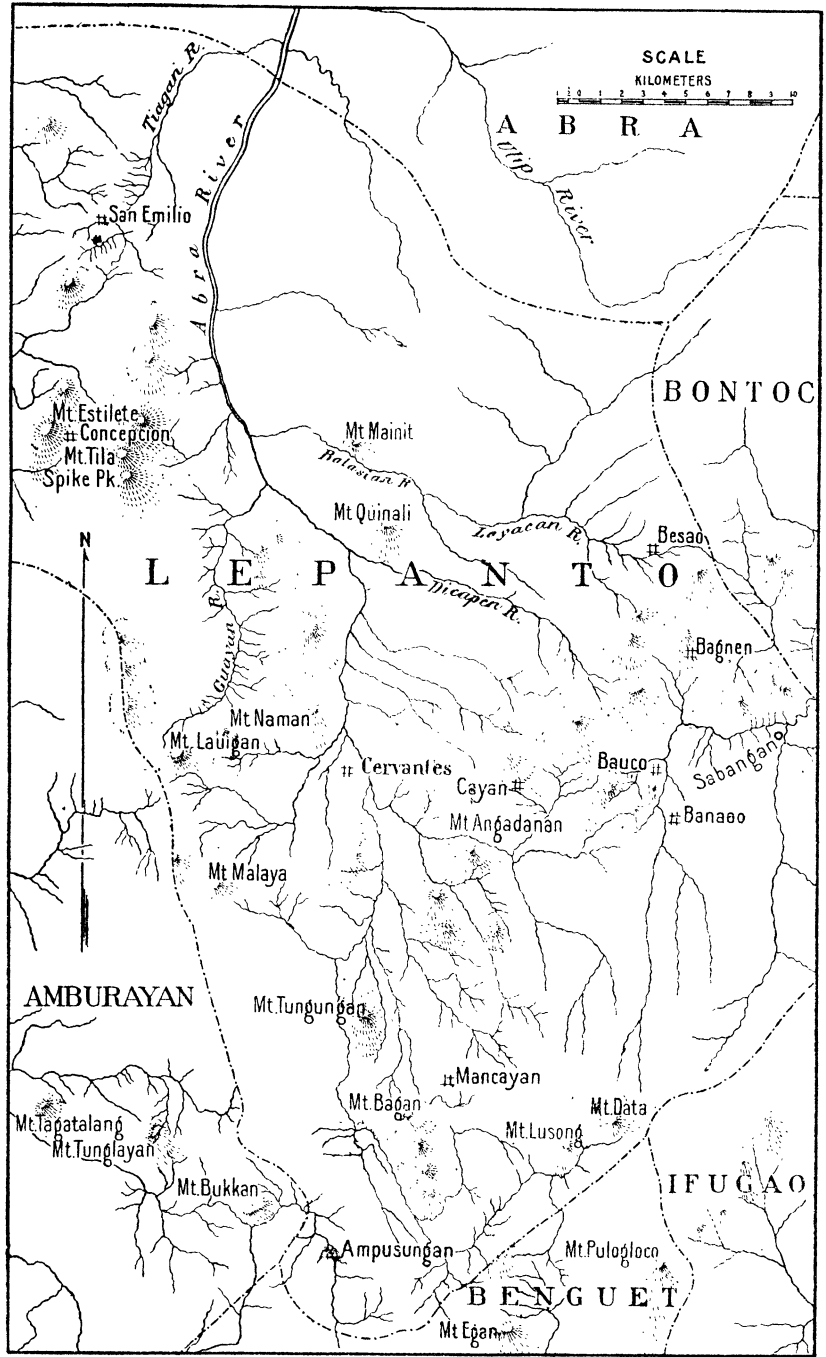


FIG. 1. A part of Mountain Province, Luzon.

information contained in the documents for Lepanto was obtained mainly from people who, although in the lower grades of civilization, are called "wild," in order to distinguish them as non-Christians from the civilized Christian Malayan races properly called Filipinos,<sup>4</sup> the essential parts relating to their customs and beliefs are here reproduced. The few stories recounted, fragmentary as they are, have come down by oral tradition through many generations; most of the practices described are still in force, although they are bound to disappear through contact with higher civilization. As will be seen by citations in footnotes, the present culture of the Igorots is not very different from that of some of the Filipinos at the time of the Spanish conquest.

It is hoped that these documents will prove an addition to what has already been published about the northern peoples of Luzon by well-known writers, such as Worcester, Jenks, and Beyer, if in no other way than as a basis for comparison. Very little has been written about the Igorots of Lepanto, and little real ethnological work has been done among them. This paper is in no sense the result of personal investigation among the Igorots, and the only claim that I make for it is as editor and compiler. In editing these accounts I have considered of minor importance the orthographic peculiarities of the partially English-educated Filipino translator, interesting as these might be in a paper devoted exclusively to the study of English as learned in the Philippines, for I fear lest the phonetic spelling detract from the subject of prime importance. Most of the errors in spelling have, therefore, been silently corrected, a very few punctuation marks and capitals altered, and a few glaring grammatical errors corrected. Otherwise, the translator, when citations are made direct, is followed strictly. The material taken from the Mancayan manuscript, however, I translated

that of the Benguet-Lepanto *Igorots* is well defined, the first *rancherias* of the latter tribe on the north and west being Quinali, Besao, Payeo, Bagnen, Bangnitan, Data, Sabangan, Bonayan, Pingad, Gayan and Namatec." He notes also (p. 851) that many Tinguians live among the Lepanto Igorots of Tiagan, Concepcion, and Angaki. The dialects spoken by the Igorots of Lepanto (p. 862) are known as Kankanai, in the southern part, and Katangnan, in the central and northern parts. Regarding their state of culture, Worcester (p. 850) says: "All in all, the Benguet-Lepanto *Igorots* must be considered far more highly civilized than any other non-Christian northern Luzon tribe except the *Tingians*." Beyer (ut supra, p. 97) implies that the Ifugaos are the most highly developed of the mountain peoples, or at least the most capable of development.

<sup>4</sup> Census of the Philippine Islands. Washington (1905), 1, 22.

directly from the Spanish, as the translation furnished was very poor and inadequate. All editorial interpolations are inclosed in square brackets. Some at least of the numerous inclosures in parentheses appear to be explanations made by the translator from Ilocano to English. These are reproduced without comment. Excerpts from the manuscripts from the several townships are reproduced in alphabetical order, according to the name of the township, and in small type. Each document, or each part of each document, is signed with the marks and names of the old men consulted and by various officials. These are reproduced in no case. Considerable aid in annotation has been given by Mr. H. Otley Beyer of the Bureau of Science. All notes by him are marked with his name. Other aid has been given by Mr. Otto Scheerer of the University of the Philippines, by Mr. Luther Parker and others of the Bureau of Education, by Dr. Merton L. Miller of the Bureau of Science, and by Mr. Otis W. Barrett of the Bureau of Agriculture.

Lepanto subprovince (see map), obviously named from the celebrated battle, is bounded on the north by Abra subprovince (which belongs to Ilocos Sur), on the east by Bontoc and Ifugao subprovinces, on the south by Benguet subprovince, and on the west by Amburayan subprovince and Ilocos Sur Province. Perez (13) says that all the territories of Lepanto and Bontoc, and a great part of Abra, were formerly called Valle de Cayán, until Lepanto was declared an independent *comandancia*<sup>5</sup> in 1852. Various expeditions were made into the district. Luis Perez Dasmariñas and other officials, in their expeditions to Tuy, in the sixteenth century, and Quirante, in his gold-hunting semi-scientific expedition in 1624, probably entered the boundaries of the present subprovince. Governor Diego de Salcedo dispatched an expedition to the mountains in 1665. But the early expeditions effected little. The expedition of 1836, dispatched by Governor Pedro Salazar, that of 1877, the earlier work in the Mission of Cayan, the mission work for some years after 1881, and the military occupation beginning with 1852 accomplished more. The term Mission of Cayan comprehended the missionary labors for much of Lepanto. However, Christianity never gained more than a slight foothold among the Lepanto Igorots.

<sup>5</sup> See the early official guides published during the Spanish régime; also, Perez, Igorrotes. Manila (1902). The chief official of the *comandancia* was the *comandante politico militar*, who combined in himself all three functions of government.

For the years 1881 to 1886, the reports show 58 marriages, 253 baptized children, 83 baptized adults, and 85 deaths of converts. For the years 1886 to 1891, the numbers are, respectively, 179, 524, 597, and 364. As a result of the mission work, various schools were opened both for boys and for girls, while 7 private schools were maintained at one time by the Igorots. None of the schools, as was natural, came to any prominence. The Spaniards desired to exploit the mineral resources of the district, and although the operations of the Cantabro-Filipino company were rather extensive for some years the exploitation was not thorough. The capital of the district was shifted from Cayan to Cervantes by the Spaniards, and the latter pueblo (now township) was retained by the Americans as the capital on the change of Government. With the creation of Lepanto-Bontoc Province, and later of Mountain Province (see footnote 2), the district of Lepanto was made a subprovince.

No real systematic study has yet been made of Lepanto and its inhabitants, despite the early missions and the fact that Spanish contact was rather close after 1856 because of the mines, while during the American régime Cervantes has gained a new importance because of its location. This is the time for a thorough ethnographical survey of the subprovince to be made, for customs are insensibly changing, and if ethnological study be delayed too long much will be lost. According to Worcester, the number of Lepanto Igorots probably does not exceed 31,000. With them are found some Tinguians and Bontocs, while the enterprising Ilocanos are pushing steadily into the Igorot territory. Already the pure culture is passing away, and the study of the real Igorot of the subprovince is becoming more difficult. The people are being raised to a higher level, and new standards are being created, for the march of progress cannot be obstructed. Within a few years, the study now possible cannot be made (Plate I).

#### AMPUSUNGAN <sup>6</sup>

According to the manuscript, the township of Ampusungan belonged to the district of Benguet until 1902. It was known originally as Alacan. The Spaniards, on account of its sparse population, did not organize it as a town (pueblo) until 1878.

<sup>6</sup> Local civil government was provided for all the townships of Benguet Province, to which Ampusungan formerly belonged, by Act No. 48, enacted November 22, 1900. Act No. 768, enacted May 26, 1903, fixed the boundaries of Benguet.

For many years the Spaniards were a source of terror to the people, who promptly deserted their homes whenever any of the *guardia civil*<sup>7</sup> appeared. The account of the customs of the inhabitants of Ampusungan is meager. It is as follows:

In the olden time our parents never used to make *cañaos*<sup>8</sup> and during their whole lives never knew of any remedies for their sickness and a great number of them died because they knew of no remedy for their sickness; but one of the old men thought that *cañaos* were good for anybody that was sick, so, therefore they used to have *cañaos* if there was anybody among them that had any kind of sickness in order that their sick might become well. And when they had their *cañaos* they used to take and kill any kind of animals and one of the old men would pray to the sun, moon, and stars and to his dead relatives, also to the *anitos*<sup>9</sup> in

<sup>7</sup> The *guardia civil* (civil guard) of the Spanish régime was similar to the Philippine Constabulary of to-day. It was, however, a part of the regular army. It was named after a similar body in Spain. One regiment was stationed in northern Luzon. See also Worcester, Philippines, Past and Present. New York (1913), 1, 378-380.

<sup>8</sup> *Cañao*, a feast. Worcester [*This Journal* (1906), 1, 850] says: "Sickness is attributed to *anitos*. Very few native medicines are employed in treating the sick and great reliance is placed in *cañaos*, at which carabaos, cattle, pigs, or chickens, according to the wealth of the sick person, are killed." The *cañao* is common throughout Mountain Province.

<sup>9</sup> Worcester [*This Journal* (1906), 1, 817] notes that the rather vague belief in the *anito* is widespread among the peoples of Mountain Province. The word, he points out, is used to designate a spirit, often that of a dead person, while the *anito* is at times represented by an image made of wood or by tying grass or leaves together. Of the *anito* or its representation aid is asked, and propitiatory ceremonies are performed to it. Belief in the *anito* is not, however, confined alone to the mountain peoples of northern Luzon. There is probably not a single people in the Philippines that does not now cherish, or that has not at some time in its history cherished, a belief in the *anito*. Even the Negritos near Floridablanca, Pangasinana, who are not Malayan, believe in the *anito*, but they probably acquired it from the Malayan people with whom they came in contact. Loarca in his *Relación* [republished in both Spanish and English in Blair and Robertson, *The Philippine Islands*. Cleveland (1903-1909), 5], written about 1580, says of the Tagalogs of Manila (pp. 173-175): "They said that this *Batala* (the Tagalog deity) had many agents under him, whom he sent to this world to produce, in behalf of men, what is yielded here. These beings were called *anitos*, and each *anito* had a special office \* \* \*. When the natives were asked why the sacrifices were offered to the *anito*, and not to the *Batala*, they answered that the *Batala* was a great lord, and no one could speak to him. He lived in the sky; but the *anito*, who was of such a nature that he came down here to talk with men, was to the *Batala* as a minister, and interceded for them. In some places, and especially in the mountain districts, when the father, mother, or other relative dies, the people unite in making a small wooden idol, and preserve it. Accordingly there is a house which contains one hundred or two hundred

order that he might be safe from any disease: "Here is an animal that we sacrifice in order that all of you may unite in the same place and use it." That was the old man's prayer. As soon as this cañao was over the sick man would feel better, and they say that the cañao that they performed acted the same as medicine. This is our strong inheritance from our old men that serves as a reminder to us and that we cannot deny, and this will be handed down again to our children.

#### ANGAKI <sup>10</sup>

The township of Angaki comprehends the barrios of Angaki, Cayos, Malideg, Patiacang, Mabalili, and Suagayan. According to the manuscript, Angaki was first inhabited in 1836. The first inhabitants came from two small settlements on the mountain just west of Angaki, but their fathers and grandfathers had gone thither from other places—a fact that proves that there was considerable movement among the mountain peoples. The first Christians came in 1884. The first *gobernadorcillo* <sup>11</sup> was appointed by Ramon Tajonera, governor of Abra Province,

of these idols. These images also are called *anitos*; for they say that when people die, they go to serve the *Batala*. Therefore they make sacrifices to these *anitos*, offering them food, wine, and gold ornaments; and request them to be intercessors for them before the *Batala*, whom they regard as God." For other old citations regarding the anito, see Blair and Robertson, *ut supra*: 6, 146; 12, 181 (Chirino, *Relacion*, 1604); 40, 71-73 (Colin, *Labor evangelica*, 1663); 40, 222, 223 (San Agustin's celebrated letter, 1720); 40, 333-336 (San Antonio *Chronicas*, 1738-44). By the early Visayans the anito was known as *diwata*. Cf. Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 196-200.

<sup>10</sup> Angaki is described by Perez, *Igorrotes*, 93-107. It is 22 kilometers northwest from Cervantes and has a picturesque location amid small streams and cascades. The township has an abundance of good mineral waters. Considerable weaving was formerly carried on there. The mission established in Angaki was organized by Fray Antonio Blanco, O. S. A. During the Spanish régime a boys' school had a more or less precarious existence.

<sup>11</sup> Montero y Vidal, *Archipiélago Filipino*. Madrid (1886), says of the *gobernadorcillo*: "Certain native functionaries, improperly called *gobernadorcillos*, exercise command in the towns; they correspond to the *alcaldes* and municipal judges of the Peninsula, and perform at once functions of judges and even of notaries, with definite powers. As assistants they elect several lieutenants and *alguacils*, proportionate in number to the inhabitants. Those assistants together with three ex-*gobernadorcillos*, to whom are referred the duties of judges of cattle, fields, and police, constitute a sort of town council." The recompense was so small that the office was almost honorary, the duties were onerous, and the incumbent of the office ran the risk of annoyances, fines, and imprisonment. Notwithstanding these disadvantages the office was much sought after. The above is taken from Blair and Robertson, *ut supra*, 17, 329, 330.

as a reward for guiding the Spanish soldiers into the mountains.<sup>12</sup> Tajonera encouraged the people to plant rice, tobacco, and other products. The first taxes were paid in wax and baskets, but "when Angaki began to grow rich, the people began to pay taxes at the rate of 12 centavos each, and in 1887 when Mr. Ramon Francia<sup>13</sup> was the governor in Cervantes, we paid 50 centavos taxes each, until the revolt between the Spaniards and the Filipinos occurred, and later we paid a contribution of 40 centavos each." The customs as related by the old men of the barrio of Angaki are as follows:

These were the customs of our forefathers when one of them wanted to get married.<sup>14</sup>

When a young man sees a young woman to whom he wants to get married, he tells it to a married man whom he asks to go and speak to the parents of the woman. And if he goes and finds out that they both have the same affection, the woman's parents tell him the day on which the young man must bring a load of fuel to the house of his father-in-law; and then each of them must begin to help the other to do some kind of work. And if it takes them a year to do this, the parents of the man and woman make an agreement as to which one of them shall build a house for the married couple. And when they have straightened out their agreement they tell it to some old man<sup>15</sup> who must then make an offering of the cañao that will unite them.

<sup>12</sup> For a description of Abra, now a part of Ilocos Sur Province, see *Memoria descriptiva de la provincia de Abra*, n. p., n. d.; Perez, Igorrotes, 271-285; and Buzeta y Bravo, *Diccionario geográfico estadístico, histórico de las Islas Filipinas*. José C. de la Peña, Madrid (1850-51), 1. The official government guides for 1848-50 show Ramon Tajonera as comandante político militar.

<sup>13</sup> Ramon Francia y Parajua, according to the *Guia Oficial de Filipinas* for 1897, was comandante político militar at Cervantes in 1897. No earlier mention of him is found. One peso (100 centavos) Philippine currency equals 50 cents United States currency. The peso of Spanish times was worth considerably less.

<sup>14</sup> See also, post, other descriptions of marriage customs. Cf. with the accounts of these documents the old customs of Philippine peoples in Blair and Robertson, *ut supra*: 3, 61 (Relation by Legazpi, Cebu, July 7, 1569); 3, 166 (Conquest of Luzon, 1572); 5, 119, 153-161 (Loarca, Relation, ca. 1580); 7, 181-184 (Plasencia, Customs of the Tagalogs, 1589); 16, 124-126 (Morga, *Sucesos*, 1609); 34, 320 (1580); 40, 88-91 (Colin, *Labor evangelica*, 1663); 40, 167-171 (Combés, *Historia*, 1667); 43, 123, 124 (Martinez de Zuñiga, *Historia*, 1803). See also Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 202, 203.

<sup>15</sup> Alonso Martin Quirante in *Expeditions to the mines of the Igorotes*, written in 1624 (Blair and Robertson, *ut supra*, 20, 274) says: "Their sages or philosophers are the oldest men or women, whom they respect and obey in an extraordinary manner, and most when they are occupied in the said feasts; for they say that then and even ordinarily those persons are wont to talk with the devil, who keeps them blinded."

Thus, when they are going to celebrate the wedding, the parties on both sides are first gathered together to see if the subsistence for the cañao is sufficient; they then tell the old men to give a cañao called *begnas*<sup>16</sup> in the old men's tribunal,<sup>17</sup> and after that they go from house to house to sing a cañao song, and after this, the wedding of the couple to be married is performed and then they will again have nine days of wedding prayer until it is finished; they should not work for three years [sic] and are not allowed to go to Candon<sup>18</sup> or any place until the three years are completed.

In general the townsmen must celebrate a feast called *begnas*<sup>19</sup> thrice a year and after each they are not allowed to work for a week if it is well done; if an earthquake or some other bad thing is predicted by the old men, they cannot work for a long time.

The immediate ancestors of the people of the barrio of Malideg migrated into the mountains from the Ilocano town of Santa Maria, in order to escape the baptism which the Spaniards were forcing on them and in order to live in accordance with Igorot customs. Until American rule, this barrio was a part of the town of Tubo;<sup>20</sup> subsequently, it was separated from that town and placed within the jurisdiction of Lepanto. During Spanish times, the tax amounted to 12 centavos per person, and until the rule by the Katipunan<sup>21</sup> the same moderate sum was required for the registration of a license for a carabao or horse. The Americans increased the taxes to 1 peso for a personal cedula and a license of 1 peso for carabaos, horses, and cows.<sup>22</sup> The customs as related by the old men are as follows:

The custom we inherited from our fathers and grandfathers is that when a young man and woman want to get married there must be one

<sup>16</sup> The religious ceremony called *begnas* corresponds to the Ifugao *hónḡa*, which is a ceremony for the general welfare of a group of people. The group may be of any size, from a single family, or a party of travelers, to a village or a whole clan. Freedom from sickness and crop failure, health, happiness, and increase of rice, chickens, pigs, and children are the chief things prayed for at a *hónḡa*.—BEYER.

<sup>17</sup> The building here referred to as a tribunal is the Lepanto structure corresponding to the Bontoc *pabafúnan* or *fawi*. See Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 50-52.—BEYER.

<sup>18</sup> A town of Ilocos Sur, with which the Igorots carried on considerable trade. Many other instances of taboo will be noticed in the following pages.

<sup>19</sup> See footnote 16. The ceremony here referred to is evidently for a large group of people. Small *begnas* are held frequently.—BEYER.

<sup>20</sup> By Act No. 293, this *rancheria* was placed in Abra Province.

<sup>21</sup> Meaning the short period of control exercised over the mountain districts of Luzon by the Filipino insurgents. The expression is in general use in Mountain Province.

<sup>22</sup> In addition to the taxes named, there was also for the earlier years of American occupancy a slaughterhouse tax of from 25 to 50 centavos for each animal killed. The taxes are higher than the legitimate taxes during the Spanish régime.



or two men to stand as witnesses to arrange the matter. Whenever one of the married couple repents and makes a complaint to the old men or *principales* of the town, they are punished with a fine of 1 carabao, 30 bundles of palay,<sup>23</sup> 6 pesos, 1 jar of *basi* or *tapuy*,<sup>24</sup> and this fine of the one who repents will be eaten by the people and not given to one person only. But if the married couple are quiet and live in harmony, the parents of the woman or wife must kill a hog; they will also take some *basi* or *tapuy* accompanying the hog's meat which they give to the parents of the husband; the relatives of the husband's party gather together and come to eat and drink; and from the time when the wife's party gives these eatables to the husband's party during a day and a night, and the time is rather good and [there is] no earthquake no rainbow nor shower or even [though] it rains heavily if [the weather be] not stormy and no chicken is caught by a hawk in the town, and no person dies, and both parents of the married couple always keep their fire alive, the married couple will then have rather long lives and many children. They then perform the marriage and the four parties of the wife and husband are gathered together and the number of animals that are killed are 14 hogs and 18 chickens or hens. These must not be less than the number needed; and these hogs and chickens should be eaten at once in one day.<sup>25</sup> There is another and last *pamegyasan* (feast for wedding), such as *baquid*, *lapsag*, *sungeb*, and *quinaoang*, and the ceremonies for these feasts are the killing of 10 hogs and 15 chickens; this is performed for the same wedding.

When anyone dies, the clothing we use must be arranged in the following order: When an old man dies, his clothing will be a blanket, a coarse G string and *abongos*, and if an old woman, the clothing will be *lamma*, *bayaong*, *bacquet*, and a coarse blanket; but if a boy dies, his clothing might be a coarse blanket; if a boy dies, his clothing must be a coarse G string

<sup>23</sup> Palay is unhusked rice; the same as paddy.

<sup>24</sup> A manuscript conserved in the Philippine Library, and entitled "Memoria aprocsimada del pais Ygorrote dependiente de la 1<sup>a</sup>. Division Militar, escrita por los oficiales Dn. D. S. y D. C. G. en el mes de Febrero de 1843, describes the drink *basi* as follows: "They (the Igorots) cook a quantity of rice, pound up another like quantity, then mix the two thoroughly with well-pressed ginger and with a quantity of hay that they call *anuad*. After the abovesaid is thoroughly mixed, they place it in a jar, the mouth of which they stop with leaves from some tree. Then they leave it under the house for about three days in order that it may ferment. At the end of that time they use it after putting water in it." Cf. Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 144], who describes the making of *basi* quite differently. According to Jenks's account, *basi* is a "fermented beverage prepared from sugar cane," and no rice is used in its manufacture. The authors of the manuscript seem to have confused *basi* with *tapuy*. For the method used by the Bontocs in the manufacture of *tapuy*, see Jenks, *ut supra*, 144. *Tapuy* appears to be much like the *bubud* of the Ifugaos. [For a full account of the methods of manufacture and difference between *basi*, *tapuy*, and *búbud*, see *This Journal*, *Sec. A* (1912), 7, 97-119.—BEYER.]

<sup>25</sup> Compare with the eat-all feasts of the North American Indians described so often by the Jesuit missionaries in their famous relations. The two seem to have but one point in common; namely, the religious necessity and significance of disposing of all of the food and drink.

and *bay-an*; and if it is a girl her clothing must be *lamma*, *bacquet*, and *lanlan*; the ceremony to be made for the dead is the killing of 10 hogs and 15 chickens; we inherited these customs from our grandfathers and fathers.<sup>26</sup> (Plate III.)

The second custom that we inherited is that we must perform a general *cañao* called *begnas* in the *abong*<sup>27</sup> (tribunal) just after planting and harvesting of the rice crop;<sup>28</sup> if there are some to be married, they celebrate the wedding just after this *cañao*; the ceremony observed for *begnas* is the killing of a dog, 2 hogs, and 3 chickens, and in the afternoon of the same day we string the meat not eaten on fine split bamboos, also the chicken and dog; there are as many of them as the number of houses in our settlement; on the third day we again take a hog to be killed to the same *abong*, and all the people in that settlement must be gathered together, and the meat must be divided among them to be distributed to our houses for the performance of a *cañao* for the hog or chicken; not one of us is allowed to go to the country to work during seven days, and no one can come into our town not even anyone who has some letters to bring us unless we let him come in; we inherited this custom from our fathers and they

<sup>26</sup> The *abongos* is a headband or turban. The *bayaong* is a woman's striped skirt, ornamented with conventional designs, and made only in Lepanto.—BEYER.

Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 79, 80] describes the clothing of the Bontocs as follows: "The burial clothes of a married man are the *los-ádan*, or blue anito-figured burial robe, and a breechcloth of beaten bark, called '*chi-nang-tá*.' In the coffin are placed a *fá-a*, or blue cotton breechcloth made in *Titipan*, the *fan-chá-la*, a striped blue-and-white cotton blanket, and the *to-chong*, a foot-square piece of beaten bark or white cloth which is laid on the head. A married woman is buried in a *kay-in*, a particular skirt made for burial in *Titipan*, and a blue-bordered waist or *la-ma*. In the coffin are placed a burial girdle, *wā-kis*, also made in *Titipan*, a blue-and-white-striped blanket called *bay-a-ong*, and the *to-chong*, the small cloth or bark over the hair. \* \* \* With the men are buried, besides the things interred with the married men, the basket-work hat, the basket-work sleeping hat, the spear, the battle-ax, and the earrings if any are possessed. \* \* \* In addition to the various things buried with the married woman, the unmarried has a sleeping hat. Babies and children up to 6 or 7 years of age are buried in the *sementera* [that is, field] wrapped in a crude beaten-bark mantle. This garment is folded and wrapped about the body, and for babes, at least, is bound and tied close about them." See also Jenks, *A. Anthropol.* (1904), n. s., 6, No. 5; Perez, *Pub. P. I. Ethnol. Surv.* (1904), 3, 237; and Lillo de Gracia, *Distrito de Lepanto*, 30.

<sup>27</sup> *Aboñg*, or *abũñg*, is the universal name throughout northern Luzon for a long, low dwelling house, built either directly on the ground or at a slight elevation above it.—BEYER.

<sup>28</sup> See Barton, *This Journal*, Sec. D (1911), 6, 81-103; and Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 103-105. Superstitions in regard to planting and harvesting are very common in the Philippines. Miss Emma Yule, a teacher in the Manila High School, has gathered together from her students many of the common superstitions regarding the planting, care, and harvesting of rice. This is entitled, *Some superstitions and customs of the Filipino farmer*, and is soon to be published.

inherited it from the grandfathers of our grandfathers, and thus we signed it and put our cross at the end of the names of those who cannot read or write.

The ancestors of the inhabitants of the barrio of Patiacang are traced by the manuscript to 1793, when they "went to a place called Balaoa, west of Santa Lucia in Ilocos Sur." The infidel Igorots were compelled to pay a tax for the benefit of living in the town and to promise to aid the Christians should harm threaten from other Igorots. In 1840, when a census or tax list of the people of Patiacang was made, the Spaniards appointed several officials in the barrio. In 1908, the barrio was organized under the American Government. No customs or beliefs are recorded.

The story of the barrio of Mabalili is as follows:

We, the inhabitants of the barrio of Mabalili, in the limits of the township of Angaki, Mountain Province, have written out this history of the customs we used and how we lived in the ancient times. The first people who cleared and formed this place into a town were Guilalo, Ao-aoiden, and Balugong; they and their wives came from Sumade; they cleared these places and planted camotes, *aba*, maize, bananas, and squashes, which they used for their food, and when they had increased in number, Guilalo and Amasan moved to the other side, called Tubó, clearing the same, and when some other people from other towns came to join them, they thought of turning the land that would be watered from the brooks into good but small rice fields; the boundary of our town is close to the mountain called Tirad on the south and touches the foot of the mountain called Tubba. The custom of marrying a young man and a young woman is first that they make an agreement and they must tell their agreement to the old men or to the *principales*,<sup>29</sup> and they [that is, the old men or *principales*] go to the houses of the parents of the girl and boy to witness the agreement; the [acts of the] witnesses are [that] the *principales* or the old men eat *etag* (salted pork); but, if at the last moment there should be one of the marriage couple who wishes to change his mind or to dissolve their marriage, we punish her or him with 25 (anything counted to that number) as was our custom in ancient times until now. Thus after the marriage of the couple has been witnessed, first, the husband goes to find fuel and brings it with him to the house of his parents-in-law and after that the wife gets a jar of water and takes it with her to the house of her parents-in-law also; as to their building they kill a hen, and if the hen that they kill (by beating the body of the hen with a stick or anything else until the hen dies) has a good and satisfactory gall, we inform our town mates; and everyone who comes to help them, must bring with him some cogon or bamboo that will be added to the materials that they are preparing for the building;

<sup>29</sup> In the Filipino town, during the Spanish régime, the *principalia* was a class made up of those who had held the office of *gobernadorcillo* and *cabeza de barangay*. The members of the class were known as *principales*. Among the mountain peoples, the chiefs and often the old men form the *principalia*.

and after the house is built, we kill a hen and then cook it mixed with etag (salted pork); but when they are going to live in the house they *mang-mang*<sup>30</sup> (to kill a chicken with a stick) a chicken in the stove inside of the house, and if the liver is all right they then stay in the house doing nothing for three days and then again kill a chicken in a fireplace outside of the house; but when they want to go to the country to work and the liver is all right, they again kill one hog in the fireplace outside of the house, and the meat of that hog will be given to those who come as their guests; and at the third day they must perform a cañao called *sagupsep* in the house using one chicken; and after seven days of *oaned* (cañao) they again *baquidan* hogs (the hogs are put in a frame called *baquidan* as required in the cañao); 2 hogs and 2 chickens are needed in this cañao; the hogs must be 1 female and 1 male; and then the chickens are put between them, and no one is allowed to go as far as or to the places where the Ilocanos live for a month, during which they will not do any kind of work.

Our customary feast which we often used to offer to God so that He may let us live longer is a general cañao. The ceremony that we make in this cañao is the killing of a hog in the country, and when we return home we must take 1 hog to the abong in which we are gathered together, and after this we must go from house to house to *agdao-es* (to ask for a hen from each house and kill it, after which the meat is strung with a fine split bamboo and distributed among the houses) a hen of those who have chickens and wish to offer something to God; this is not compulsory if a man has no chicken. After the said *dao-es* we must perform 2 cañaos called *ubaya* and *sagupsep* in the abong, and the ceremony observed is the killing of 1 pig and 1 hen inside of the abong, and if the livers of the two are satisfactory and puffed up<sup>31</sup> then we can go to the country to work after seven days. This must be done yearly for we ought to follow the customs which we inherited from our forefathers. Since the first time when our town was inhabited by the original dwellers, the chief ruler was called *campo*,<sup>32</sup> and each man had to pay a tax of 8 centavos. In that time the Spanish tobacco graders were called rulers; there was then also a measuring of tobacco.<sup>33</sup> Both men and women had to pay taxes of 25 centavos each, and when the Spanish priests were scattered around, each man and woman had to pay taxes of 50 centavos, but in the year 1901, when the Katipunan was in control of the Islands, each man contributed only 20

<sup>30</sup> *Maṅg-maṅg* means to view or to look at. In this case, the author means that they will kill a chicken and look at its gall to learn the omen. Such metaphorical uses of *maṅg-maṅg* are common.—BEYER. See also Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 200, 208, 209.

<sup>31</sup> The manner of reading the omen from a chicken's gall is the same among all of the Igorot, Bontoc, and Ifugao peoples. If the gall bladder is full of liquid and has a smooth surface the omen is good, but if it is empty and the surface wrinkled the omen is bad.—BEYER.

<sup>32</sup> From *maestre de campo*, the title of a Spanish military officer of high rank.

<sup>33</sup> Governor Basco de Vargas established the government monopoly over tobacco in the Philippines in 1781. At first this resulted advantageously, but it was only a forced benefit both to people and government, and soon the evils of the monopoly became apparent. It was finally repealed in 1881.

centavos; and in 1903, we, the men, had to pay taxes of 100 centavos; in 1904, we had to pay a cedula tax of 1 peso, and road tax of 2 pesos—in all, 3 pesos. Besides these there is another tax yearly ever since the United States of America took control of the Islands.

We have also to relate in this section our custom when a young man marries a young woman, in order that they may be married; the relatives of both sides must be all gathered together and must make their customary ceremony for a wedding; they surround a *coobran* (jar) of tapuy with pieces of wood and erect a *bebe* (a piece of log) at the door of the house, and the ceremony that they perform is the killing of 5 hogs and some chickens; and after this wedding they cannot go very far away from home for a year. But when they have a child they perform a caña called *bayas* as a *galut* (clothing) of their babe, and the ceremony that they must perform in this caña is the killing of 10 hogs besides some chickens used for their habitual offering that we inherited from our forefathers. And this is the result and end of the offering as to our ways and living at Mabilili, but in order that the position of our place might be seen, we will mark out the rivers, brooks, and mountains."

The barrio of Suagayan was named from *oaig* (brook), so called from a river on its eastern side. Customs are described as follows:

The custom of the forefathers in the ancient times when the young men and women married was a peculiar one; they did not get married (as the Christians do), but they were committed to two old men who witnessed their marriage. And they [that is, the old men] decided the day on which they must celebrate the wedding, in order that the husband and wife may live together in the same house. If one of the married couple wishes to be divorced" from the other, a fine of 1 carabao and punishment of 25 strokes is imposed upon him or her; this was the law of our forefathers in the ancient times. The organization of this village was quite good for we compelled all the lazy fellows to work and plant certain crops to feed themselves with. And thus our custom is that we must perform a caña called *begnas* (just before planting and harvesting the crops) and two after the performance of *begnas*. We perform another caña the ceremony in which is the killing of 1 hog. We must perform certain cañas as offerings to God so that He may save our hogs together with our chickens.

"A rough plan accompanies the manuscript, which is not reproduced here.

"Worcester [*This Journal* (1906), 1, 850] says: "The Benguet-Lepanto Igorots are monogamous. Children are betrothed at a very early age and often marry at the age of puberty or even before. Strong attachments are not uncommon among the married people and divorce is relatively rare." Some men in Lepanto keep concubines. The manuscript *Memoria aprocsimada* says of marriage: "Among these heathen, the passion of love is unknown, because they marry when very young. In the negotiations the contracting parties have nothing to say, for on this occasion, they are subjected to the caprice and wish of their parents. The latter generally base their reasons on one of the two following things. The first is when two intimate friends have their wives with child at the same time; and they agree to bind their offspring together, if it happen that one bear a

BAGNEN <sup>36</sup>

In olden times this town was known by the name Bagnen. When the Spaniards were in control of this country, they called it *rancheria* of Bagnen, but when the Katipunan were the rulers they called it a municipality, and now the present Government names it a township.

No one knows the exact time when this town was settled; the oldest men at this time and those who have been told of the history by their old people say that this town was organized before the Spaniards came to this country, and thus we do not know the names of the principales and settlers who were the forefathers of the present inhabitants of the barrios.

Four barrios form the township of Bagnen, and their names are as follows: Bagnen, Data, Laylaya, and Balintoogan.

In ancient times each of these barrios, except the last named, Balintoogan, was called a *rancheria*, and each of them had a *gobernadorcillo*, *teniente mayor*, *alguaciles*, and *cabezas de barangay*, who were the officials that governed their town, and they had appointments given to them by the *comandante político militar* who was in authority in the district. This was not then called a province but *Distrito de Lepanto*."

son and the other a daughter. The second is when two friends have children, one a male and the other a female, whom they desire to be related by marriage. The contract having been made by the parents and the day set for the espousals, they advise the old woman who acts as priestess. The families assemble in the house of the parents of the bride. The drum-beat notifies the people of the village and neighbors that there is a function in that house. This is at the cost of the father of the groom. The people give 5 pesos to the father of the bride, unless the bride and groom are of importance. Then presents of 30 or 40 pesos are generally given, with which, together with what the father of the groom expects to spend, they buy *basi*, *carabaos*, and pigs which are taken to the house of the bride."

"Bagnen is located 22 kilometers east of Cervantes. It was out of the usual route of communication, and its inhabitants were more backward than those of other pueblos. During the time of the tobacco monopoly, considerable tobacco was raised in Bagnen, but after the repeal of the monopoly only enough for home consumption was planted. After 1890 some coffee was raised. See Perez, *Igorrotes*, 203-207.

"A name originally applied by the Spaniards to a small collection of huts. Some of the so-called *rancherias* in the Philippines approached a small hamlet in size.

"*Teniente mayor*, head lieutenant; generally head of a *barrio*. *Alguacil*, constable of the courts or of a municipal body. *Cabeza de barangay*, formerly the chief of the old Filipino government unit, the *barangay*. The Spaniards retained the title and made the office appointive or elective. The incumbents of this office were made responsible for the collection of the tribute and taxes, and each officer was supposed to be responsible for 50 families. They were subordinate to the *gobernadorcillo*, and together with him and all *ex-gobernadorcillos* and *ex-cabezas de barangay*, formed the *principalia*. See Blair and Robertson, *ut supra*, 17, 331; 40, 83, 347-349. *Comandante político militar*, the highest Spanish officer of any given military district. See Worcester [*This Journal* (1906), 1, 850]: "While all the settlements of the Benguet-Lepanto *Igorots* have their own govern-

The fourth barrio, named Balintoogan, was lately organized. This place is on a steep side of a large mountain between Bagnen, Sagada, and Besao. The people who are living there came from the villages of Ambasing, Balugang, and Amquileng. They left these (places) on account of the sinking and falling away of the ground and owing to fear they moved to the place which is now called Balintoogan.

There are no records showing the list of the officials of this town or the time when they served and thus we cannot give a true and exact account but nevertheless those whom we know and have heard of are as follows:

Names of 24 *gobernadorcillos*, 6 *tenientes mayores*, 7 *cabezas de barangay*, 4 *presidentes*, 4 *vice-presidentes*, 11 *concejales* or councilors, and 2 *secretary-treasurers* follow. These officials "served since the time of the Katipunan, who are succeeded by the present government," but they are not of sufficient importance to be reproduced here. The manuscript continues:

#### A SHORT DESCRIPTION

The township is situated on the steep sides of the high mountains; the people are very poor, because there is not enough good land for them to work; it is divided into small villages because the people found that the mountain side where they can plant camotes, a little maize, and other vegetables from which they could obtain their food was a rich land; camotes are the important food of the people of this town. There are some small parcels of rice fields owned by the people, but they are very hard to cultivate because they are made along the creeks and on hill-sides, and they look like disarranged steps of vertical ladders; they cannot use carabaos to plow them because they are in such bad places. They must patiently dig and clean them, and then they can plant rice in them. They are always digging camotes, but rice can only be harvested in the time of *calgao* (dry season) on account of the cold weather in these places.<sup>39</sup>

#### RELIGION AND CUSTOMS

There is nothing to show or any proofs of any true religion which these people possess or follow, but they believe that there is a God and they call Him Cabunian;<sup>40</sup> they believe also in the souls of the dead,

ments, organized in accordance with the white man's law, there still remain *Igorot* representatives of the families from which came the chiefs of former days, who have more influence than have any of the present elected officials. Not a few individuals of these families have attained to considerable wealth."

<sup>39</sup> See Lillo de Gracia, *Distrito de Lepanto*, 39-41. See also a description of agricultural methods among the Bontocs by Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 88-107]. The rice terraces of the Ifugaos are one of the wonders of the Orient. The stone walls, many of which are of great height and exceedingly well made, have an appearance of great age.

<sup>40</sup> I doubt if Cabunian is the name of a deity. It is probably a place. In the Ifugao religion it is the name of the sky region where most of the greatest deities dwell.—BEYER. Beyer [*This Journal*, Sec. D (1913),

and call them anito; and their manner of praying or making offering is somewhat like that of the people in ancient time," the only difference being that in ancient times when they made prayers or offerings they killed a sheep<sup>42</sup> for the ceremony; but now the ceremony that they observe whenever they make any offering to God (Cabunian) is the killing of a hog or a chicken.<sup>43</sup>

8, 99], speaking of the Ifugaos, says that Cabunian is the layer of the sky world "immediately above the Earth World, and it is the blue-stone underfacing of this layer that we call the 'sky.'" Fray Benito Herosa, O. S. A. [see Perez, *Pub. P. I. Ethnol. Surv.* (1904), 3, 243] identifies Cabunian with the sun.

"Of the religion of the Igorots, Alonso Martin Quirante (Blair and Robertson, *ut supra*, 20, 273, 274) says: "The Yglotes are an idolatrous race. They say that their god is the sky, whom they call Cabunian; and they offer and sacrifice to him, in their banquets and feasts, swine and carabaos, but under no consideration cows or bulls. The method of sacrifice practiced by them is [as follows]: Having tied all the animals not prohibited about the house of the sacrifice, after the ceremony an old man or old woman, having placed on the ground a painted cloth that resembles a surplice, and which they call *salili*, they proceed to kill the animals, and make a great feast. They keep that up for two or three days until they have finished eating what they have, when their feast or *magunito* also finishes. He who keeps up such entertainment longest, and kills most of the said animals is most respected." See also, Perez, *Pub. P. I. Ethnol. Surv.* (1904), 3, 137, 138, and Jenks, *ibid.* (1905), 1, 196-215.

<sup>42</sup> Thus in the manuscript, but probably a dog is meant, as no sheep are found in Mountain Province, except those brought in from outside, such as those now owned by the Jesuits at Baguio.

<sup>43</sup> See the description of a sacrifice witnessed among the Visayans in 1521 by Antonio Pigafetta, who accompanied Magellan, in Robertson, Magellan's journey around the world. Cleveland (1906), 163-167. See also, Blair and Robertson, *ut supra*: 3, 163-165 (Conquest of Luzon, 1572); 3, 198, 199 (Relation of the Western Islands called Filipinas, 1573); 5, 131-133, 163, 173-175 (Loarca's Relation, ca. 1580); 7, 185, 190, 191 (Plasencia, Customs of the Tagalogs, 1589); 12, 265-272, 302, 304 (Chirino, Relation, 1604); 13, 59, 72, 81; 21, 137, 138; 29, 284-286, 293, 294 (Bobadilla's Relation, 1640); 30, 190-192, 288, 289; 31, 145, 146, 155; 32, 55, 56, 248; 33, 167-171; 34, 319; 38, 219, 221, 236, 239; 40, 70-89 (Colin, Labor evangelica, 1663); 40, 167 (Combés, Historia, 1667); 40, 221, 223; 40, 335-339 (San Antonio, Chronicas, 1738-44); 43, 105 (Ortiz, Practico del ministerio, ca. 1742); 43, 124, 125 (Martinez de Zuñiga, Historia, 1803); 47, 301, 302 (Perez, Relation of Zambales, 1680); 48, 107, 125, 129, 132. See also, Perez, *Pub. P. I. Ethnol. Surv.* (1904), 3, 242, 243. Mr. Luther Parker, of the Bureau of Education, Manila, has seen the sacrifices still performed by the half-wild mountain people of Panay. They resemble closely the sacrifice described by Pigafetta. The manuscript above cited, *Noticia aprocsimada*, gives an account of sacrifices among the Igorots, especially of that called *jaluvalu*, which is defined as the sacrifice of pigs.



They often do this, and there is no day designated especially when they have a celebration or feast to thank Cabunian for giving them a good crop to harvest, or for the increasing of their animals, their good health, or whenever there is a wedding (*bomayas*),<sup>43</sup> or when one of them dies. (Plate II, fig. 2.)

They surely believe that there are souls, and they say that anitos of their forefathers visit them frequently. They have also a belief that these anitos are the companions and helpers of Cabunian to look after the people, to give prosperity, and also to give hardship and bad luck to the people; if one of their children is sick, they say that the anito of their forefathers visited him and thus they must kill a hog or a chicken to feed him. They believe that this offering of food is eaten by the anito and that he will give health to the sick and cure him.<sup>44</sup>

According to their customs, whenever they go to any place or go to another town or the authorities call them, they must first have a *cañao*; or if they intend to do something they first perform a *mamidis*, the so-called *pidis*, which is that they must kill one chicken to see if its liver is satisfactory; if it is good and full they continue, but if it is unsatisfactory they stop and have another *mamidis* (to kill a chicken and see the liver).

When they are already on the way, if a crow, mouse, snake, etc., runs across the road, they at once stop their journey. They say that it is bad luck or that the object of their journey will not be accomplished or that it will turn out badly. For that reason they must stop for a while or else return to the town which they started from.<sup>45</sup>

It can be seen that there exists great union among them, for when one of them has something to do and cannot do it alone all the people will agree to help; when one is going to build his house, all the people must help him to secure all the materials and other things needed and help build the house asking no pay.<sup>46</sup>

If there is a person of any kind who asks a shelter in their house, they feed him and request no pay; they are humble and obedient to the orders of the authorities.

#### BANAAO <sup>48</sup>

"Official names of the barrios are: Banaao, Dacudac, Pandayan, Lebga, Cagubatan, and Cada-anan."

"A *bumayas* is not a wedding. It is a great ceremony given only by members of the aristocracy as a public demonstration of their right to their titles. It is often given by an aristocratic couple immediately following their wedding ceremony.—BEYER.

<sup>43</sup> See footnote 9.

<sup>44</sup> These superstitions were common in early times to all the peoples now called Filipinos. Cf. Blair and Robertson, *ut supra*: 7, 189 (Plasencia, Customs of the Tagalogs, 1589); 40, 341-346 (San Antonio, *Chronicas*, 1738-44). There are many references in Philippine documents to this superstition.

<sup>45</sup> But they expect to and do receive a very considerable quantity of food and drink.—BEYER.

<sup>46</sup> Banaao is located 18 kilometers south of Cervantes. It is the center of extensive rice fields. See Perez, Igorrotes, 141-152.

"The barrio of Dacudac was formed into a barrio on August 31, 1908; the five other barrios were formed in olden times; the old men living now have no idea as to when these barrios were formed."

The names of the original families and of the officials as far back as known follow. The manuscript proceeds:

#### CUSTOM OF DRESSING OF THE IGOROTS

For an Igorot one suit of clothes is sufficient for a year; this consists of a handkerchief, a blanket, and a G string for the men and of a *camisa*, a *tapis*, a waist bandage, and a string of head beads, which they call *banges*, for the women.

The women in this township do not wear their hair any longer than it is worn by the men; the headwear of the men differs from that of the women. The women can only use a string of beads; they are not allowed to wear anything like the men's head string. The men's headwear is a piece of cloth or handkerchief which they wind around their head; they are not allowed to wear the head ornament of the women.<sup>40</sup>

The "*muebles*" [that is, possessions or property] of the Igorots consist only of *pupputic* (jars).<sup>41</sup> There are many different kinds, such as *bunay*, *sinal-itan*, *inot-otot*, *pucao*, *guilas*, *pinaypayao*, *tinodco*, *lungboy*, *bimaog*, *guinalman*, *lucian*, *saoit*, and *gayang*; and also a string of gold, which resembles a necklace and is called *camaqui*. All these properties are held very sacred by the Igorots, and they must not be sold; they would rather have their rice land sold than these properties, because they regard them as sacred relics of their forefathers.<sup>42</sup>

The jars are used to make *tapuy* in, a drink made out of rice which they drink at any time as it is a means of diversion for them; the jars and other things are also used in the celebration of *cañaos*.

<sup>40</sup>Alonso Martin Quirante (Blair and Robertson, *ut supra*, 20, 269) thus describes the clothing of the mountain people in 1624: "The usual dress and clothing of that people is a loose shock of disheveled hair that reaches below the ears, and certain bands about one *jeme* [span] wide made from the bark of trees. Having wound these about the waist, they twist them so that they cover the privy parts. They call these *bahaques*, and they are worn by all classes of people, men and women. Besides the said *bahaque*, the chiefs wear Ilocan blankets, which they have inherited from their ancestors; this garment is crossed from the shoulder to the waist, where they knot it. Thus do they go, without any other clothes or shoes." See also footnote 26.

<sup>41</sup>That is, things made of clay. *Putik* is a common northern Luzon word for clay or mud.—BEYER.

<sup>42</sup>Throughout the entire extent of the Philippine Archipelago are found jars of Chinese origin, mute witnesses of the great extent since the earliest times of Chinese trade. Many of them are centuries old, and are considered among the most priceless treasures of their owners. See Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 117-121, for a discussion of Bontoc pottery. See also Cole and Laufer, Chinese pottery in the Philippines, *Field Mus. Pub.* (1913).

All Igorots have tapuy in their houses; it is for them a kind of a household god; they always have tapuy set aside for drinking purposes, and no matter how much they have on hand it is sometimes drunk up in one day, because when the Igorots gather together and sit around in the shade without having anything to do, and they just feel [like drinking] it, they go from one house to another to hunt for tapuy, and when they find some, although the owner may be absent, they drink it all without regard to what the owner might say upon his return. When the owner returns and finds his tapuy gone, he can't say anything, because it is their custom to do so. (Plate II, fig. 2.)

#### SUPERSTITIONS OF THE IGOROTS WHEN GOING AWAY FROM HOME

When an Igorot goes anywhere and a bird of any kind flies across the trail ahead of him he discontinues his journey because it predicts a failure of his purpose or he might get into trouble; but, if he insists on going ahead in order to avoid delay, he must stop for about a half an hour right at the place where the bird crossed the trail, or else he must return to his home and make a new start.

#### IGOROT CUSTOMS

The Igorots have a custom of going to sit nearly every day in a high place from where all the trails and roads leading to the town can be plainly seen;<sup>52</sup> there they do nothing but clean themselves of their head and body lice (*coto*, head louse; *toma*, body louse); one Igorot cleans the head of another and so on. While sitting around that way they do also some simple work, such as making baskets, which are called *taddo*, *balloco*, *labba*, etc.<sup>53</sup> In each of the barrios there is a little house called

<sup>52</sup> Alonso Martin Quirante (Blair and Robertson, ut supra, 20, 269) says: "Their settlements are established on the peaks of the mountains, and on the roughest of them, whence afar off they can see all the paths, so that no one can approach them without being seen by their sentinels, who always guard their posts day and night."

<sup>53</sup> Labba is the term employed by the Ilocanos for the large carrying basket. The following information was furnished by the Bureau of Education in Manila. "Relative to Lepanto-Igorot basketry in general the following information can be given. Nearly all Igorot baskets are made entirely of rattan. Other materials, such as *nito*, are sometimes used in decoration. The rattan may be dyed black, red, or yellow for decoration. Two methods of construction are used: binding and braiding. The former is most common. It implies the employment of rather strong strips bound together by smaller pliable strips. By this method rigidity, beauty, and any desired shape can be secured. Large *tampipis*, vase-shaped storage and carrying baskets, and small trinket baskets of all kinds are made by this method. Baskets made by the latter method are pliable and not so pleasing to the eye. They are made entirely of narrow pliable strips braided together. Winnowing trays and rude carrying baskets are the principal products of this method." The following note was furnished by Dr. Merton L. Miller of the Bureau of Science: "In the Philippine museum all the basketry from Benguet and Lepanto is grouped together as there is very little, if any, difference between the basketry of the two subprovinces. It consists of carrying baskets;

*dalipey* (tribunal), where the young men over 8 years of age and the widowers sleep. Boys and girls old enough to wed do not sleep in their parents' home; the young women seek the houses of widows or women that are not living with a man and sleep in their houses as long as they are not married; the children sleep in the house of their parents.<sup>44</sup>

A young man that has been sleeping for some time in the *dalipey* that wants to get married and has already found a girl that will have him, gets two or three old men to go to make a marriage agreement with the parents of the girl; the only point which they have to settle is the *sabong* (dowry)<sup>45</sup> that the man is to give to the bride. If the *sabong* is satisfactory to the girl's parents then they kill a rooster and a hen and get some *tapuy*. If the gall of the chickens proves unsatisfactory, they kill two others and so on until they find two whose galls are satisfactory; the expense for this is borne by both parties.

The old men commissioned by the bridegroom also send after his father, but not until after the agreement about the dowry has been settled; and these old men are considered as the witnesses to the marriage; the girl's parents send after the young man to live with their daughter after three days have passed, although this time can be extended to one or two years. The husband and wife can be divorced at any time they wish, without anybody being able to prevent them from doing so. A divorce is sought for the following reason: If they have no children, despite the continued observance of the *pasang* (a prayer to the *anito* to give them children). If the husband is the one that first suggests a separation, the dowry given by him to his wife will be left to her, but if the woman first suggests the separation the dowry will go back to the husband, but what property they have accumulated during the time that they have been married will be shared equally between them. The divorced parties must not have any hard feelings toward each other during their lifetime.

#### ANOTHER CUSTOM OF MARRYING

The parents of both the boy and girl have a talk with each other and make an agreement to marry their children; the boy's parents turn over to the girl's parents the dowry agreed upon, which remains in their possession; if rice land, they work it until the children get old enough to marry; the profits therefrom are used for the maintenance of the girl; when the children are grown up and then refuse to marry each other, the dowry is returned to the boy's parents.

carrying frames; pouches worn by men and women; storage baskets; hats; baskets for carrying eggs, ore, and fish; and fish traps. These are made almost entirely of rattan and bamboo." Cf. also Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 121-123.

<sup>44</sup> *Dalipey*, see footnote 17. Beyer says that the sleeping customs of the Lepanto Igorots are the same as among the Ifugaos and that there is no public sleeping house for girls as in Bontoc. But see page 493, where a communal house for girls is described. This may have been borrowed from the Bontocs.

<sup>45</sup> See footnotes 14 and 35. The dowry, which was always given by the man, was an important condition of marriage throughout the Philippines.

## HOW THE IGOROT WORKS

The women do all the work in the rice and camote fields; they till the soil by means of iron bars; they transplant the rice and also cut the rice when it is ready for harvest; the men only help the women to build the walls in the rice fields and to carry home, once a day, part of the rice that has been cut by the women.

The men's work consists in pounding out the rice from the palay, getting the water for home use, pasturing the animals if they have any, cooking their rice, feeding the hogs, taking care of the house, and carrying the baby around.<sup>4</sup>

To build or remove an Igorot's house is very easy; no nails are needed, only split bamboo is used to join the house together; the house is constructed out of lumber, it has only 4 posts; the boards used are 1 decimeter thick, 4 decimeters wide, and 2 meters long.

When an Igorot intends to remove his house, he prepares two big jars of tapuy with which to entertain the people at his house; at twilight he sends a man to notify his neighbors and townspeople that he intends to remove his house to another place the next day, so that all those who were so notified will not go away but come and work on his house that day; this house is built entirely during one day's work. When it is completed, they drink the tapuy that has been prepared for them, but eat no food.

## CLIMATE

The climate of Banaao is pretty cold throughout the year; we raise two rice crops a year.

There are no more old barrios left in this township in which any of the present inhabitants were born.

All the people living in any of the barrios, comprising this township,

<sup>4</sup>Lillo de Gracia, Distrito de Lepanto. Manila (1877), says: "The Igorot woman is the one who attends to the planting, and on that account she is away from home most of the day. The man only plows the field and builds the rock walls of the fields. After these labors the men only attend to public matters, and even in the performance of the latter tasks, it is usual to see the women substitute the men. The children accompany the women. Meanwhile the man stays at home, cooks the rice and other food, and amuses the nursing children while their mothers are away. They give the children masticated *morisqueta* [cooked rice] from their own mouths. It would not be imagined that a robust, agile man, well able to work, should lend himself to so feminine an occupation and pastime, unless this was a fitting custom of the law that belongs to woman among heathen people of backward intelligence. On the other hand, the men are wont to work for a medium wage, far from their own neighborhood, and for a very small sum do not hesitate to carry heavy loads. They are good cultivators, and are always eager to get seeds and plants unknown to them." The report just cited is excellent and the work of a good observer. Lillo de Gracia was comandante politico militar of the district of Lepanto. Among the Bontocs, some care of the children devolves on the men. See Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 134-136.

observe the same custom and manners in the celebrating of the 9 following described cañaos:

1. Cañado called *bagaoas*. This cañado is attended by all the people who have a house of their own in the barrio that celebrates the cañado; this is an offering to the anito that they may have a good rice crop and [that the anito may] protect their rice from the plague of mice and keep their grain from drying up.

The ceremonies gone through in their cañado are the killing of a hog in the yard of a deserted house, called *ao-a*. After the hog is killed, one-fourth of the liver and one-half of the breast are strung on finely split bamboo and dropped into boiling water; after this is boiled it is taken to a particular place, together with a dish of rice and a dish of tapuy, all of which, an old man, accompanied by a prayer, offers according to custom to this particular anito; after the ceremony, the old man, who made the offering, takes for himself all the provisions set aside for this ceremony; the rest of the meat is sold to anyone who wishes to buy some. Then they also make an offering for the protection of their rice from the plague; this meat, so used in this cañado, is cooked and eaten the same as any other meat.

2. Cañado called *quesley*. This cañado is an offering and prayer to the anito to protect them against any kind of sickness or disease.

The ceremonies for this cañado are the killing of a hog (the hog is burned); after the hog is killed, one or two old men take their spears and sit down facing the killed hog, which they offer to the anito, together with a dish of rice and a dish of tapuy; as is the custom after the prayers are said, these two old men, together with others, examine the gall. If it is large and puffed up, the sickness, if any, will be cured within a few days, but if the gall is small and bad they kill another hog; and if this gall is still bad they continue to kill hogs until they find one that has the right kind of a gall, but if the man killed the last hog that he can buy or can get, and the gall continues to be bad, then they give up hope and the sick person's life is in danger.

3. Cañado called *bayas*. This cañado is a feast of rejoicing in which the Igorot shows his affection and good will toward his neighbors, town mates, and other friends.

The ceremonies made in this cañado are the killing of 2, 3, 5, 7, or 12 hogs; in addition to this, horses, cattle, carabaos, goats, sheep [sic], chickens, and other animals that the person giving the cañado wishes to kill.

In this cañado there is always more meat than can be eaten by the visitors to the cañado; the rest of the meat that is left from one day's cañado is cut into small pieces corresponding in number to the neighboring houses, relatives, and friends who are living in other places, [and] this meat is then distributed among them. This cañado can also be made in honor of one who is dead, but without any kind of music; but if it is only a feast *ganzas*<sup>77</sup> are used.

The one giving this cañado must stay in his house for ten days without coming out and without speaking to anyone except his housemates, nor must anyone go into his house or even into his yard during those ten days.

<sup>77</sup> *Ganzas*, the brass gongs used throughout the Orient, and probably of Chinese origin.

4. Cañao called *tongcala*. This cañao is to the anito to whom offerings or promises have been made by a person while sick [who] says this, for instance, "I shall offer up a hog, together with music, according to the custom, if my sickness be cured."

The ceremonies observed in this cañao are the killing of a hog; an old man, accompanied by ganzas, takes the head of the hog, together with the liver and a little of the meat (muscle), and puts them on the end of a dry piece of wood covered with the tops of sugar cane or with the whole plant; after holding this meat up on the end of the piece of wood, it is taken off and cooked and eaten by the people; the person giving this cañao will have to stay in his house for ten days.

5. Cañao called *baquid*. This cañao is celebrated in case the water used for irrigating the rice fields sinks into the ground and in that way passes the rice fields that are to be irrigated.

The ceremonies for this and for the increase of the water are as follows: An old man goes with the owner of the field to the place, taking with them a small pig, a chicken, and a basket, which are needed when they eat; upon arriving at the place they kill the pig and the chicken and offer them up to the anito of the fields; after the ceremony is over they cook and eat them; the person who makes this cañao must stay in his house for one day.

6. Cañao called *pacde*. This is a cañao by all the people of one village or barrio to the anito so that he may give them a good crop of rice and other crops and make the grain fill out good.

The ceremonies gone through in this cañao are the killing of a hog in the following manner: The old men bring with them a hog covered with a shield and spear, and taking it near the edge of the barrio there they kill (burn) the hog and cut it into pieces for an offering to the anito; they look at the liver, and if it is good they do not kill another hog, but if it is bad they kill hog after hog until they find one with a good liver.

The meat of the killed hog is not eaten by the old men who only eat the liver; the meat is cut into as many pieces as there are houses in the barrio that is giving this cañao; the meat of every hog that is killed in this cañao, is divided to correspond to the number of the houses. Each piece of meat is strung on a split piece of bamboo and so distributed among the houses.

The value of all the hogs killed is figured up and the amount is divided by the number of houses; when it is determined what the share of each will be, they pay it to the headman or chief of the cañao, and he pays the owners of the hogs that were killed.

This cañao is celebrated twice a year, before the planting and harvesting of the rice. During this cañao, every one not living or belonging to that barrio is driven away, and nobody is allowed to enter the barrio, except the officials who pass through or whose duty it is to come to the township, who may be allowed to enter.

Across all paths and trails leading into the town or barrio that is celebrating this cañao a design of green leaves is made into an arch, which is the sign that no one may enter.

None of the people of the barrio in which this cañao is held are allowed to go to another barrio or other place while this cañao is going on, and every one must take great care of his animals, chickens, etc.,

for it is a bad omen should a hawk or other bird take away the little chickens.

7. Cañao called *pasang*. This cañao is celebrated by married people who have lived together for a certain length of time, but who have neither sons nor daughters, in order that they may have children.

The ceremony in this cañao is the killing of a hog to be offered up in the yard of the married couple, together with the things needed in the house, such as a turban of beads, camisa, belt, etc., all things used by the man as well as by the woman, and some money in addition to the above things. All these things are put together into a big wide flat basket; the woman takes the basket on her head and starts to dance and the man dances around her for about an hour, accompanied by the beating of a *ganza* or *salibao* (drum). The married couple must not do any work for two days.

8. Cañao called *palis*. This cañao is for the protection against poisoners and that the poison used by them may become harmless.

This cañao is principally performed when a person is sick; it is for the purpose of finding out the real cause or reason for the person's sickness; but, if it is known that the person was poisoned, then this cañao is for his cure (medicine); the ceremony in this cañao is the killing of a dog, a cat, a hen, a turkey, a duck, or a goose. If every one of these animals has a bad liver, the person will die, but should they have good livers then the person will be cured and will become well.

9. The cañao that can be performed daily is the killing of a hen or other chicken; the Igorot can make this cañao as an offering or prayer to the anito when anyone is sick; if he kills a chicken the anito will cure his sickness, providing that the chicken has a good liver.

If anyone intending to go on a trip cañaos [that is, makes a cañao with] a young chicken or a hen having a good liver, he will have a good trip; if he is accused of anything or some one makes a complaint against him, he kills a chicken; if he finds the liver good, he will win; but if bad then he will surely lose; the meat of these chickens is eaten.

The person making this kind of a cañao is forbidden to go to the country or other place to work for one day and during that day he is also prohibited from speaking to anybody except to members of his own household and no one is allowed to enter his house during that day.

The real sign of the termination of any one of these nine cañaos is that on the morning of the third, fifth, or tenth day, as the case may be, the person giving the cañao goes to a brook or river, a little way from his house to bathe; he takes with him his spear and sticks a long chicken feather in his hair. In this manner he informs the people that the cañao is over.

On the last day of the cañao and when he goes to the river to bathe, he does not speak to anyone nor does he look behind nor beside him; should anyone speak to him, he will only shake his head.

Everybody knows just what kind of a cañao anyone is performing, because a certain kind of a bunch of green leaves is put up at the gate in front or at the side of the house.

During the celebration of any one of these nine cañaos, no one taking part in them can do any kind of work in the country or other places, [but] in their own houses they are allowed to do certain kinds of work. The people are prohibited from working or from leaving their



house when they celebrate any kind of a *cañao*, especially during the *cañaos* called "*pacde*" and "*palis*," because if the people living in the *barrio* where the *cañao pacde* is being held go to the country or other places to work, they will have a bad harvest of their crops during one year. If during the *cañao palis* the people go to work in their fields they will have no water for their fields for one year; and if they work on their *lapog* (*cañgan*)<sup>58</sup> it will dry up as there will be no moisture.

#### BAUCO<sup>59</sup>

Bauco township has 4 *barrios*; namely, Guinzadan, Vila, Ibanao, and Bauco. Guinzadan, one of the oldest places in the province according to the manuscript, was formerly called Liliteg, "but when a big flood came and destroyed the town and cut it in two by a river they changed Liliteg into Guinzadan which means, damaged by water." The Spaniards established a government in this *barrio* after several campaigns waged against the Igorots of the district. The names of many officials are given. The *barrio* of Vila was so called "after a certain kind of soil that can be made into pots and pans." The story of its settlement is as follows:

One time there was a famine in Quiapan and the married couple, Tayapan and Guislan, ran away to Guibasan Mountain and there they built themselves a hut according to the Igorot ways; a short time after Tayapan and Yang-gacao followed them to that place, and they did not go back to Quiapan any more, and so became the forefathers of the people of that place.

In due time a Spanish government was established in Vila, and after that "the Katipunan controlled this town for a short time" and until the coming of the Americans. The *barrio* of

"The *cañgan* method of farming consists in a progressive deforestation, that is, small areas of, say, 1 to 5 hectares are felled and burned, then planted to rice, camotes, maize, yams, beans, etc.; by the end of the second season, however, so much cogon and other grasses and weeds have become established in the comparatively rich new forest soil that their influence upon any successive crop would be very great; usually, therefore, only 2 crops or perhaps in some localities 3, are grown in each cleared space; cogon then takes possession of the clearing and this, being burned every dry season, soon reduces the humus content in the otherwise rich soil (the mineral salts in the ashes readily leaching out in the rainy season). This is a most pernicious and reprehensible practice considering the waste of good land, first, through allowing cogon to enter the clearing, and secondly, through burning the cogon every dry season, thereby killing all forest seedlings and rapidly exhausting the humus. The method has been extensively used in the mountain regions.—BARRETT.

<sup>59</sup>Bauco is located 18 kilometers east of Cervantes. Its inhabitants are industrious and possess many rice fields and at one time raised many cattle. See Perez, Igorotes, 191-193.

Ibanao received its name "because there was a lake in the middle of it." The story of its foundation is as follows:

Smallpox broke out in Quiapan, Bauco, and all people attacked by this disease died. Ando and Doma, a married couple, ran away to Patog-ó Mountain, and there they built a small hut; later Tanca and Andeo went after them to the same mountain and lived with Ando and Doma; as long as they lived there they never returned to Quiapan, the place where they came from, and they were the forefathers of the people.

"After the administration of the Spanish government, the Katipunan ruled these places for a short time," but the latter was defeated by the Americans.

#### BARRIO OF BAUCO

The ancient story of Padoca and Adian<sup>60</sup> who lived in Tabeo Mountain. The man was Padoca and the woman was Adian, their first child was a boy named Opig, the second was a girl named Daoquen; when the children grew up and there was no one to marry, they married each other; when this family increased in number, they looked for a spring and a good place where they could till the ground; they found the mountain called Quiapan and settled there, and when the people grew more in number, they named the place Bauco. There also came people from other places. Not long after this Comandante Casanuba,<sup>61</sup> who lived in Cayan, arrived there; he came with many guardia civil and many people of Cayan, and fought against the people of Bauco. After the fight they received a cane of authority from the rulers.<sup>62</sup>

The Spanish, Katipunan, and the Americans in succession governed the place. Various customs are described as follows:

#### MARRYING CHILDREN

Boys and girls that are old enough to marry don't sleep in their homes with their parents; the young women go every night to the house designated for them to sleep in, and the young men go to sleep in the atato (tribunal).<sup>63</sup>

<sup>60</sup> The fragment of an origin myth.

<sup>61</sup> Casanova. Probably before 1852, as the names of the comandantes politico militar, up to 1890, do not show this name.

<sup>62</sup> A tasselled cane given to the chief official of a pueblo in Spanish times as a badge of authority.

<sup>63</sup> See footnote 54. See also Lillo de Gracia, Distrito de Lepanto, 27. Among the Bontocs, the girls sleep in a communal house called *ólâg* from the time that they are about two years old until they marry. The Igorots of Bauco may have borrowed this custom from the Bontocs. Among the Bontocs *ato* is used to designate one of the political units of the township. The *at-ato* of the town of Bauco evidently combines the functions both of the Bontoc *pabufunan* and *fawi*. See Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 49-55.

At night time, young men go to the house where the young women are sleeping; if a young man that has been sleeping for some time in the *at-ato* wants to get married he tells it to the young woman whom he likes; the young woman, if she likes the young man, tells him to go to find firewood which will be taken to the house of the woman's father; the young woman goes to the house of the young man's father and brings him *camote* or rice as a sign to the parents that their son and daughter want to get married. After these ceremonies the parents of the young man and woman make an agreement that the young man shall go to the house of the woman's father and perform a *cañao* with a chicken. Three days after the performance of this *cañao*, they perform another *cañao* with a suckling pig. When they have been living together for one year, they get 3 or 4 hogs and with these hogs they again kill a suckling pig which shows that that day the last *cañao* has been performed.

#### THE IGOROT CUSTOMS

The ancient people used the bark of trees for G strings and their hats were made of fine splints of bamboo; the women made their *tapis* out of the fibers procured from certain kinds of trees.

When a man has a complaint to make he gathers all the old men together and tells them his complaint. The old men, after they have heard the complaint of the plaintiff, call the defendant or accused and let them speak face to face and listen to the matter. After the old men have heard the cause of the dispute of the two fellows and they have no witnesses, they let them prick each one's head with a needle; the one whose head bleeds will lose and he whose head does not bleed will win; or they let them throw a stone at each other and the one who hits the backbone is the winner; if the old men don't want to try the case in [one of] these manners, they get 2 chickens from one hen and give one to the plaintiff and the other to the defendant; each one then burns his chicken and cuts it in two before the old men. The owner of the chicken whose gall is the larger loses and the one whose chicken has the small gall wins.<sup>44</sup>

At the beginning of planting rice in the seed beds, all the people perform a *cañao* with a hen or rooster; before the transplanting of the rice plants in the field, they perform another *cañao* with a chicken, and after the performance of this *cañao* they must transplant all their rice plants to their rice fields. After the transplanting, they again celebrate a *cañao* with a chicken, which shows that they have finished rice planting.

Before the beginning of the rice harvest every one is prohibited from leaving his town or his house, because all the people must perform a *cañao* within ten days. The ceremony they make in this *cañao* is the

<sup>44</sup> Cf. trial by ordeal among Filipino peoples as related by various authors in Blair and Robertson, *ut supra*: 16, 129 (Morga, *Sucesos*, 1609); 40, 85, 86 (Colin, *Labor evangelica*, 1663); 40, 152-154 (Combés, *Historia*, 1667); 40, 343, 357 (San Antonio, *Chronicas*, 1738-44); 43, 109 (Ortiz, *Practico del ministerio*, ca., 1742); 43, 123 (Martinez de Zuñiga, *Historia*, 1804). See also, Lillo de Gracia, *Distrito de Lepanto*, 20; and Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 168-171.

killing of a hog or a chicken; ten days after this cañao an old man of the township goes and kills a hog or a suckling pig near the foot of a large tree, and after this they may harvest the rice; after harvesting all their rice the people perform a cañao as a sign that they have finished the harvest. The ceremony they make in this cañao is the killing of a chicken.

After the planting of camotes, the men with spears and shields go to the mountain to pray to the souls of the dead persons and when they have returned home they all go to the tribunal or abong; the head or chief of the tribunal takes a cup of water and a spear and puts them in front of the tribunal and prays.

The next morning he gets a dog or a chicken which they kill and cook and place in a dish and set it in a certain place; this is the food for the dead that they called to when they went to the mountain.

When a certain kind of cañao is being performed, all the roads or streets or paths leading into the township are closed in order that the people from other towns may not come into their town.

The man who begins to build a house and sees a mouse does not continue it, for he thinks that it is very bad luck. After the materials for a house are collected and the house is built, if the owner of the house sees a snake or a mouse before he has occupied the house, he removes his house to another place. After the erection of the house when it is removed, if the owner does not see a dog, a crow, or a snake, he performs a cañao with a chicken; three days after this cañao, he again performs a cañao by killing a suckling pig; after all these things are done, if the owner does not dream any superstitious beliefs regarding his house, he moves into it and does not leave it for three days; he again performs a cañao with the ceremony of killing a chicken; but when he dreams something bad he will leave the house and find another place where he may build his house.

*Igorot names for the months of the year.*

*Libtong*, January.

*Atong*, February.

*Panlitanan*, March.

*Becas*, April.

*Deam*, May.

*Aduq*, June.

*Hoa-ó*, July.

*Leppas*, August.

*Tioay*, September.

*Tiguey*, October.

*Quiling*, November.

*Esec*, December.

Each month of the year is named or called by the Igorots according to the climate, weather, or season of that month, also by the birds and the things they did during that time.<sup>65</sup>

<sup>65</sup> This is a very common practice in all parts of the world. A manuscript history of the Visayas in the possession of the Philippine Library gives such a calendar that purports to have been handed down from as early as 1543. Mr. H. Otley Beyer, of the Bureau of Science, and Mr. Luther Parker, of the Bureau of Education in Manila, have both gathered important data of early calendar systems in the Orient, which it is hoped will soon be published. Quirante says (Blair and Robertson, *ut supra*, 20, 274) that the Igorots do not "know what day, month, or year, or the increase and decline of the moon, signify. They govern themselves by one

[Continuation of footnote numbered 65.]

star that rises in the west, which they call *gaganayan* while they call the natives of the neighborhood by the same name. On seeing that star they attend to the planting of their waste and wretched fields in order to sow them with yams and *camotes*, which form their usual and natural food." Cf. also, Blair and Robertson, *ut supra*: 5, 165 (Loarca, Relation, ca. 1580); 7, 189, 190 (Plasencia, Customs of the Tagalogs, 1589). Mr. Otto Scheerer, of the University of the Philippines, in a letter to me very appropriately warns against considering the native words of the calendar of the above text as the exact equivalents of the months of our calendar. They do not indicate divisions of thirty or thirty-one days. Mr. Scheerer says:

"Their names indicate the beginning, lapse, or end of rural occupation or natural phenomena, which used to take place at more or less the same time indicated by our moons, but are far from being so sharply defined and are really more in the nature of 'seasons,' such as our 'harvest,' 'fall,' etc. Bauco, being a town in Lepanto, the words [of the calendar in the text] should be, so far as I know, Tinguian, a dialect of which I possess very scant information and other people, too, I believe. We possess, in the matter of linguistic data concerning these Islands, such a mass of confused and unreliable information that I should hate to see it added to in the more enlightened era of investigation by Americans. I notice that these names must have been taken down by some Filipino from the lowlands, since they show the characteristic Spanish orthography current among the Christian population of the Islands. This spelling is, however, also found adopted by one or the other literate Igorot. All I can do is to compare them with identical or similar words in other known dialects from northern Luzon, without, however, vouchsafing, in so doing, that there exists an actual identity of meaning.

*Libtong*. This word occurs in the same form in Ilocano, where it means lake or ditch of stagnant water.

*Atong*. In Isinai the word *atung* means heat, warmth, sickness. In Ilocano *atang* designates a superstition consisting in placing the first pickings of some fruit, a plate of meat, or of any other food, in the corners of the house, in the garden, or field, or somewhere in the mountain, in order to appease some malign spirit. In Ibanag *atang* means any kind of herb used as a vegetable. The change from 'o' in *atong* to 'a' in *atang* might be nothing else than a different pronunciation of a certain indistinct primitive sound well known to linguists as the 'pepet vowel.'

*Panlitanan*. This word is unknown to me. In structure it is characterized by prefix *pan* and suffix *an*, which often help to form words indicating either the place or the time where or when the action indicated by the stem is executed, so that *panlitanan* may mean the time when that is done which is expressed by *litan*.

*Becas*. In Inibaloi, *bekás* means hulled rice, which in Ilocano is *bagás*, in Tagalog *bigás*. Observe here again the indistinct (pepet) vowel-changing from 'e' to 'a' and 'i.'

*Deam*. This is an unknown word. It might go back to a form *dalam*, *dayam*, *dagam*.

*Adug*. In Ilocano and Pampanga (and old Tagalog?) *alog* means inundated, low-lying land (whence, tagalog, dweller on such lands). The changes from 'd' to 'l' and from 'u' to 'o' are very common.

[Continuation of footnote numbered 65.]

*Hoa-ó*. This is an unknown word. I refrain from speculation on a possible identity of this word with similar words in other dialects.

*Leppas*. In Ilocano, *leppás* means the time when something (a work, the year, the day, etc.) finishes or is finished. In Bontoc, *lipash* is a season beginning about July 1; *lipash* expresses the idea of finishing or accomplishing.

*Tioay*. This is an unknown word.

*Tiguey*. In Inibaloi, *tige* is the word for maize. In Ilocano, *tigi* is the name of a plant whose tubers are fed to pigs.

*Quiling*. In Ilocano, *kiring* designates the time when the rains cease. The change from 'l' to 'r' offers no difficulty. I have no doubt that we have here the same word.

*E-sec*. In Ilocano, *isek* is a kind of early rice. In Inibaloi, *asak* gives the idea of planting; the vowels are indistinct. In Bontoc, *iseg*, *ishek*, *issek* express the idea of sowing, planting.

"If we remember that Igorot calendars divide the year generally into sections that are named from the characteristic field work undertaken at the various periods, or from plants flowering, or birds appearing, at such times, we may safely set down, I believe, the present calendar as coming fully within this general description."

See also, Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 219, 220.

Some additional information has been received through Mr. D. M. Thomas, division superintendent of Mountain Province. This was obtained through the interest of Mr. C. H. Magee, assistant director of Education. Mr. Thomas cites as his authority "Rev. M. Vanoverbergh, the Belgian missionary at Bauco, who is compiling a vocabulary of the local dialect and his accuracy cannot be questioned as in all his work he is exceedingly methodical and accurate." According to the above authority, the names of 11 periods of time used in Bauco, reckoned roughly from new moon to new moon, are as follows, beginning near the first of the Gregorian year:

<i>Lúya</i> .	<i>Wáo</i> . The name of a red hairy caterpillar.
<i>Lede'w</i> .	<i>Panabá</i> .
<i>Upóc</i> .	<i>Tíway</i> . The name of a sparrow; going away.
<i>Bacákew</i> . Sorghum.	<i>Adug</i> .
<i>Kitití</i> .	<i>Kiliñg</i> . Furious fighting.
<i>Kiáñg</i> .	

The words as given in the document belong to the Lepanto-Igorot dialect as spoken in Bauco, with the exception of *libtong*. The root of *panlitanon* is a Bauco form, although the word itself is not used by the Igorots of the township of Bauco. *Libtong* is an Ilocano word meaning a pond, marsh, or swampy place. The meaning of the words of the document that can be identified by Father Vanoverbergh are as follows:

*Atoñg*. Heat.

*Panlitanon*. This is a Cayan word, meaning the time when the palay heads.

*Litun* means pregnancy, but the term is applied, even in Bauco, to palay; with the prefix *pan* and the suffix *an* it is used only in Cayan.

*Déam*. Rainy season.

*Waó*. Thus accented, it means eight.

*Lépas*. A *cañao* celebrated after the harvest.

*Tégey*. Coarse cloth.

*Eséc*. Seed; *is-éc*, to sow.

BESAO <sup>65</sup>

The material for this township furnishes some very interesting and important data. The township contains 8 barrios; namely, Besao, Payeo, Ambaguio, Padangaan, Abeo, Ayubo, Banguitan, and Agaua. The township, which was organized in 1904, contains a population of 3,502, all Igorot and pagan, except the family of the secretary-treasurer, which is Christian. A list of officials since 1904 is given.

## HISTORY OF THE BARRIO OF BESAO

We, the old men of this barrio, caused it to be written, stating the facts as they have been handed down to us from our forefathers, who were the original people of our barrio.<sup>66</sup>

Ganggang-á and his wife Casindo of Lamaoan came to make their home in a place, now known as Besao, owing to the fact that their means of making a living had become exhausted in Lamaoan. Ganggang-á said to his wife, "We would better leave our home and find another place where we can make our living." Ganggang-á had a sister by the name of Abay; when Ganggang-á and his wife decided to move, Abay, his sister, did not want to accompany them, but decided to go down to a town called Busalan, a barrio of Candon, in the Province of Locos [that is, Ilocos] Sur, where she eventually married. Ganggang-á and his wife went in the opposite direction looking for a good place where they could settle; on their way they stopped at a place now called Besao to rest for a couple of days, during which time Ganggang-á looked around for a place to make their home. He observed that the land around there was very fertile, so they decided to remain there. During the long time that they had to wait before their camote patches began to produce, they lived on nothing but vines and wild gabe.<sup>67</sup> During the course of many years they had 4 children, 2 girls, named Lagmaya and Golla, and 2 boys whom they named Madalang and Laongan. After these children became men and women their father wanted them to get married, but there were no other men or women in the place now called Besao whom they could marry, so they intermarried. Madalang married his sister Lagmaya and Laongan married his sister Golla; Madalang had 6 children by Lagmaya, 4 boys and 2 girls, and Laongan had 5 children by Golla, 2 boys and 3 girls. When Madalang and his brother Laongan's children became old enough to marry, they intermarried with their sisters, with the exception of one, the youngest son of Madalang, because there was no girl left for him to marry. Therefore, Ganggang-á

<sup>66</sup> For a description and partial history of Besao, see Perez, Igorrotes, 171-177.

<sup>67</sup> What follows is a confused account of a primitive origin myth. The marrying of brother and sister is very common in these stories. Cf. Blair and Robertson, *ut supra*, 5, 121-127 (Loarca, Relation, ca. 1580), in which the brother and sister consult the tunnies of the sea, the doves of the air, and the earthquake, successively, in order to calm the qualms of the woman.

<sup>68</sup> Gabe, or taro, *Colocasia esculentum* (L.) Schott, a plant (both root and leaves) used extensively in the mountain districts. See Census of the Philippine Islands (1905), 4, 121; see also Merrill, E. D., *A flora of Manila*. Manila (1912), 134.

said to the brothers of his youngest grandson that they must take their youngest brother to Loma-oan to find him a wife; so they went to Loma-oan and stayed there until their brother was married. Then they returned home bringing with them Langaya, the wife of their younger brother. Up to this time the people in the place now called Besao had increased to 18 persons, or 9 families. These were the forefathers of the people now living in Besao, with the exception of a few that came later from other towns.

When the population of the place now called Besao reached the number of 300, including men, women, and children, they considered themselves strong enough to go down to the coast to buy salt, without being molested. So Maxsil headed a crowd of 50 persons and started for the coast; when they came to the sitio of Locbuban in the confines of Santa Lucia, Ilocos Sur, they met a man and his son. When the man saw the Igorots with their spears and shields he ran away, leaving his son there, a boy about 9 years old; the Igorots captured the boy; some of them wanted to cut his head off, but Maxsil said, "Let him live, because I want him for my son (Maxsil being sterile), for this is the place where Abay, the sister of our grandfather, made her home and married, and who knows that this boy is not related to us." They discontinued their journey to the coast and returned home taking the boy, that had been captured, with them; the boy said that his father's name was Aquino and that his name was Quiño. Maxsil brought Quiño up in the place now called Besao; the boy Quiño acquired the customs of the Igorots and became a very industrious man. Maxsil married Quiño to one of his nieces by the name of Dalinsa, and they raised a family of 7 children, 3 boys and 4 girls. By this time Quiño became homesick; he thought of his father and mother, and he asked the old men of the community if they would not allow him to go down to the coast to visit his parents. They agreed, and some of the old men accompanied him; they took with them 70 men, armed with spears and shields in order that they might protect themselves against the people that might want to attack them. When they arrived near the town of Santa Lucia they halted and Quiño took with him 8 men as guards to go with him to his father's house. When they arrived at his father's house the door was closed, as it was night already. Quiño called out, and his father asked, "Who is there?" Quiño answered, "I am Quiño, your son!" His father and mother became very angry when they heard this reply, as they thought it certain that their son, Quiño, had been captured by tattooed Igorots. The old woman got a torch and the old man armed himself with a club, as he wanted to punish the man outside who claimed to be his son. As soon as they opened the door, they recognized their son; they were convinced that he was the son they had lost years ago, though he was naked and had long hair like a woman, as was the fashion of the Igorots in those days. The old man cried out, "Here is my son that was taken away by *Busos*,"<sup>99</sup>

<sup>99</sup> See Worcester [*This Journal* (1906), 1, 845 and 850], who says that the Igorots of the northeastern mountains of Benguet, the Kayapa district, are called *Busaos*. This word means enemies, and is not a tribal designation. Scheerer [*Pub. P. I. Ethnol. Surv.* (1905), 2, pt. 2, 99] says, "The term *busol* is not so much a tribal name as a hateful designation of the head-hunting, cattle-thieving, and kidnaping Igorot living around and south of the mountain Data in what is sometimes called the *Kabusolan* or territory of the *Búsol*." See also, Perez, Igorrotes.



and he has returned to me!" When their neighbors heard this they all gathered around the place and all were very glad. When all the relatives had gathered together, Quiño gave them a complete narrative of his life among the Igorots and he also told them that he was married to an Igorot woman. His relatives were very glad to see Quiño again, and they extended to him and his companions a kind welcome and hospitality. While they were in Santa Lucia, an order from the civil governor of the province of Ilocos Sur was received there, stating that every town must send to Vigan, the capital of said province and the official residence of the civil governor, their representative, to receive the cane of office as capitan of their town. Quiño's parents and relatives advised him and his companions to go with them to Vigan; they consented to go, and when they arrived at Vigan they presented themselves to the civil governor there and requested that their *rancheria* might be organized into some kind of a government and that one of their men might be given authority to look after the community, in order that the name of Buso, by which name the people on the coast call the Igorots, might be changed. The civil governor appointed Quiño as *maestre de campo*, and gave him the cane of authority, a cane mounted with a rooster-shaped gold knob. The *rancheria* was then formed into a town and was named Besao. Formerly the people called this country the Buso's territory; the word Besao was derived from the word Buso. After Quiño had received the cane of command, they all started for home, by way of Candon. When they arrived at Candon they inquired for the relatives of Abay; they found them, and it resulted that Quiño was descended from Abay and, therefore, was related to the Igorots that captured and cared for him. As a token of relationship, the relations and descendants of Abay granted to the Besao people half of the plain that lies between Santa Lucia and Candon, for them to make their homes there in case they wanted to remain there. (A long time ago, it was said that the plain east of Candon belonged to the Besao people.) When the necessary papers were made out for the granting of this plain to them, they returned to their town, Besao. At that time the civil governor had imposed on the people of Besao a yearly tax; to wit, 2 pounds of beeswax and a jar for the whole town. Any time that they took their taxes to Vigan they always returned by way of Candon; there they stopped and collected salt and cotton in payment for the rent of the land granted them by the descendants and relatives of Abay, who were occupying it at the time. After many years had passed, during which time the Besao people had always collected the rent for this land, the people of Candon send word to our old men to come to Candon and bring with them the papers regarding the land in order that they might renew it. Sablay and Mangudang took the papers down to Candon and, upon their arrival there, Sr. Alberto Guirnalda and Alferez Leon's father took the papers from them; they made out new papers and copies of them were given them. They returned home without having anyone look at them to see whether they were right or not; when they returned to Besao they carefully put them away; after a good many years they showed those papers to a sergeant of infantry, stationed at Sagada, a close-by town; great was their surprise when they heard the contents of the paper read to them, as follows: "The Besao people are not in any way to be restrained to pass back and forth to Candon and they are free to make their homes in any place they wish." This was entirely different from what they had imagined.

At the nomination of another *maestre de campo*, to relieve the outgoing one whose term had expired, the old men went again to Vigan by way of Candon. They stopped there for a while to talk over the matter of the land, but the people of Candon denied everything, and when our people asked them to return to them the old papers about the land they informed them that they were burned up. That ended the collection of rentals for this land, and from that time on they had to pay for all the salt and cotton that they got from there. They proceeded on their journey to Vigan, and when they arrived there they called on the civil governor and requested him that he change the title of their official from *maestre de campo* to that of *gobernadorcillo*. The civil governor granted them their request, and Mangudang was appointed with that title and became the first *gobernadorcillo* of Besao, and after Mangudang had received the cane of office they all returned to their homes. About that time Sr. Antonio,<sup>9</sup> a Spaniard, arrived at Cayan as *comandante politico militar* for the province of Lepanto; not very long after that a man from Vila, a *barrio* of the *rancheria* of Bauco, made a trip to Besao, and upon his return he stole a *carabao*, but the people saw him and pursued him; they overtook him at a place called Anaman in the confines of Besao, and there they killed him. When the Vila people heard that one of their men had been killed by the Besao people, they made a complaint to Sr. Antonio, the *comandante politico militar*. Sr. Antonio sent a force of soldiers against Besao, headed by a captain of infantry. The people of Besao heard of this expedition and the old men gathered together and with the *gobernadorcillo* went to meet them. They displayed a white flag (a piece of white cloth); they took with them also a drum, and the *gobernadorcillo* carried his cane; when the captain of infantry saw all these things, he knew that the people of Besao were not *alzados* (outlaws). However, he arrested all the old men, together with the *gobernadorcillo*, and took them to Cayan, the official station of the *comandante politico militar*. Upon their arrival there, a great many people from different towns had gathered there, to witness the executions, for they believed that the Besao people were going to be shot. The Besao people were taken to the upper story of the *comandancia*, to the office of the *comandante politico militar*, and after he had heard their declarations he decided that they were peaceful people and gave them G strings, made of *condiman*,<sup>11</sup> also some handkerchiefs; but, in the place of Mangudang, he appointed Gaoli *gobernadorcillo* for the three towns of Besao, Payeo, and Banguitan, and gave him the official cane; he also appointed other subordinate officials; such as *teniente mayor* and *cabezas de barangay*. The people from the other towns, who had come there to witness the executions, were greatly surprised to see that instead of these people being executed they had been given clothes and had been honored with official positions besides.

<sup>9</sup> Probably Antonio Perea, the first *comandante politico militar* of Lepanto, who held office during the years 1852-56. See Perez, Igorrotes, 47 and *Pub. P. I. Ethnol. Surv.* (1904), 3, 362.

<sup>11</sup> *Condiman* (Ilocano for red) is a red cloth used extensively by the Ilocano women for making the small upper covering worn by them, as well as for tablecloths, towels, and various other purposes, such as the decoration of buildings on certain holidays. It is also traded by the enterprising Ilocanos with the mountain peoples.

A list of the officials of Besao, covering the period of eighty-eight years follows. The account bears the name of the presidente and secretary and the names and marks of the old men consulted.

ORIGIN AND LIFE OF THE FIRST MAN AND WOMAN THAT SETTLED IN THE BARRIO OF PAYEO, BESAÓ, LEPANTO, MOUNTAIN PROVINCE

Angpeo and Dam-may, his wife, both of the rancheria of Tubo, Abra, came to make their home in Banay, where they lived all alone. A girl was born to them, and they named her Siding. They lived on nothing but wild gabe, bananas, and *camote-moro*,<sup>12</sup> as they had no rice nor anything else. When Siding grew up to be a woman, a young man from the rancheria of Deydey, subprovince of Bontoc, came to their place and married her. After being married many years, 3 children were born to them, 2 boys and a girl; they named the boys Baccangen and Daguillo and the girl, Biana. When these children became men and women, a young man from Tubo, whose name was Bulalacao, and who was somewhat related to Angpeo, the original settler, came there, and after staying there for some time with them married Biana. He told his father-in-law that he would go and bring his sisters over from Tubo and they could marry his two sons; he went after them, and when they arrived (their names were Un-nanay and Licona) Baccangen married Un-nanay and Daguillo married Licona. Bulalacao had 7 children with Biana, 4 boys and 3 girls; 6 children were born to Baccangen and Un-nanay, 3 boys and 3 girls; 7 children were born to Daguillo and Licona, 3 boys and 4 girls. The children of Bulalacao, Baccangen, and Daguillo, when they became old enough to marry, married among themselves. By that time they had increased to 30 persons; then people from other places began to arrive and settle among them. Among the new settlers there was a woman named Caducali; nobody knew where she came from. She brought with her a stalk of rice; she gave this stalk of rice to Cote, the headman of this little community, and said to him, "This is the best food for people, take it and plant it in a seed bed, and when the stalks have grown big enough transplant them into swampy ground." She also said, "You had better move into another place and make the place where you are living into rice land." Therefore, they moved to the uplands and named it Payeo and turned the land from which they moved into *payeos* (rice paddies). From that time on rice was raised to a great extent.<sup>13</sup> The population had also considerably increased, but owing to so many people coming from other towns it is impossible for us to learn the origin of all of them.

THE BEGINNING OF ENMITY BETWEEN IGOROTS AND CHRISTIANS

Langlangquioan, Oaquing, Pasicat, Lobdoy, and Bocasi, of the towns of Besao and Payeo, went down to the coast to find some work in the town of Santa Maria, Ilocos Sur. At the east side of this town they met some hunters from Santa Maria, who were looking for a dog that had strayed

<sup>12</sup> The *camote moro* a yellow-fleshed, red-skinned, sweet potato, grown more or less commonly throughout the Archipelago.—BARRETT.

<sup>13</sup> The Ifugao myth of the origin of the lowland or irrigated rice is very similar to this.—BEYER.

from them. When they saw the Igorots they thought that the Igorots had stolen their dog, as it was known that Igorots eat dogs; the Christians persuaded the Igorots to follow them, telling the Igorots that one of them had some work for them to do; they went with the Christians, who had them that night to sleep inside of a strong bamboo fence; when they were sound asleep, the Christians killed every one of them, with the exception of Bocasi, who succeeded in escaping. The Christians buried the bodies of their victims in Santa Lucia.<sup>14</sup> Upon Bocasi's return home, he told his townspeople what had happened to them. Thereupon the people of Besao and Payeo planned a head-hunting trip to Santa Maria; they started for that place, and when they reached the outskirts of the town they saw a young man carrying ears of corn on his head. They killed him and cut off his head, arms, and legs and then returned home again, full of joy that they had avenged themselves for the cruelty of the Christians. From that time on, the Besao and Payeo people stopped going to Santa Maria until the time when Quiño went to Vigan and was appointed *maestre de campo*; then the Igorots and the Santa Maria people made peace, with the friendly help of the people from Santa Lucia.

#### MURDER OF A YOUNG BOY

Pasingan and one of his sons, a boy about 7 years old, named Bulay-oc, went to Suagayan River, now in the confines of Angaqui, to fish. While fishing, instantly and without notice, they found themselves surrounded by Busos from Cagubatan.<sup>15</sup> Pasingan's intentions were to make a stand against the Busos and defend his son, but he saw that it was useless, because he was greatly outnumbered, and that if he did not run away he also would be beheaded. The Busos cut off the boy's head, arms, and legs, and left the body there; when the Busos had gone, Pasingan returned and took the body of his son to Payeo. After three months, the whole town of Payeo went on a head-hunting expedition to Cagubatan; on their way they encountered the Cagubatan Busos, who were also on a head-hunting expedition; fighting began between the two parties, which resulted in a defeat for the Payeo people, 2 of their men being killed, Matel-lo and Yotayot, and their heads, arms, and legs being cut off. When the Cagubatan Busos had gone, the Payeo people went back to the place for the bodies of their companions, which they took back with them to their town, after which they had a mourning *cañao* that lasted about three months. After the termination of this *cañao*, they selected some of their men to go to Cagubatan to recover, through purchase or exchange of gold, putic (jars), and brass gongs, the heads, arms, and legs of the men that had been killed. They started out, and upon reaching Sumadel they found a leg of one of their people; they held a little

<sup>14</sup> For relations between the Igorots and other Philippine peoples, see Blair and Robertson, *ut supra*: 20, 258, 275, 276; 21, 149; 23, 280; 43, 77; and 48, 82, 83. For their relations with Spaniards, see 14, 281-326; 17, 306; 19, 161, 255; 20, 262-303, 306; 28, 158, 167, 238; 31, 261, 262; 37, 245-249; 38, 228; 43, 76, 77; 48, 56, 57, 68, 70, 73, 81-90, 128, 131; 50, 170; 51, 49, 56; and 52, 215.

<sup>15</sup> See Beyer, *This Journal*, *Sec. D* (1913), 8, 94, and Lillo de Gracia, *Distrito de Lepanto*, 21, for interesting accounts of the customs and beliefs of this place.

cañaos over it and then proceeded on their way. At Masla they found another leg, also one at Lobong; they found out that the people of Tadian and Cayan were in possession of the arms. When the Payeo people saw that all the neighboring towns were their enemies, they turned toward home, and when they went through Sumadel they redeemed the leg they found there with a putic worth about 100 pesos; then they went home. They told the people about the arms and legs and where they were; the old men then decided to send other men after the heads of their people that were killed. Banaoi and Dagdagnen were chosen for this errand; they took with them brass gongs, jars, and gold. When they reached Cagubatan they informed the people there that they had come to exchange gold, putic, and brass gongs for the heads taken by them from their people; the Cagubatan people killed them and then took their gold, jars, and brass gongs. The Payeo people waited many days for the return of Banaoi and Dagdagnen, and when they did not return they sent some of their men to look for them. When these men arrived at Sumadel, they commenced to kill the people there; when they had taken four heads they returned to their town, highly satisfied at being avenged; upon their arrival in their town they held a cañaos that lasted about four months. Shortly after this, the Sumadel people also started on a head-hunting expedition against the people of Payeo and Besao, but when they were halfway between Sumadel and Besao, a man that was gathering firewood saw them and ran to inform the Payeo and Besao people; immediately these two towns started out to meet the Sumadel expedition, which prevented the Sumadel people from getting into their towns. At the mountain Batay the two parties met and had a fight; the Sumadel people were defeated, and one of their warriors was beheaded by the Payeo and Besao people. When the people of Sumadel and Masla realized that they had no show against these two towns, Payeo and Besao, Quabang and his wife Ecyey decided to go to Vigan<sup>16</sup> to make a complaint to Sr. Galbey,<sup>17</sup> the commandant of infantry. Upon arriving there they presented themselves to the commandant of infantry and said to him, "We, husband and wife, have come to ask your protection against the people of Payeo and Besao who are exterminating us, and if you will go and punish them we will give you a piece of gold, in the shape and about the size of a dog." The comandante of infantry went to Payeo with 30 soldiers; upon arriving at a place called Sacaan, a sitio close to Payeo, the old men of Payeo went out to meet them with a white flag, made out of the bark of a tree, and took with them also things to eat, among them some chickens. The comandante made friends with them, and went to Pandangaan and remained there five days in order to observe the people, and when he was satisfied that the Payeo and Besao people were not bad people he told Quaban and his wife that their complaint was false and that they must go and get the gold, the size of a dog, that they had promised to give him. When they brought the gold, the comandante was greatly surprised, because it was not as big as the size of a dog, but it was only as big as a

<sup>16</sup> The capital of Ilocos Sur Province.

<sup>17</sup> Possibly the Col. Guillermo Galvey mentioned by Santos, *Informe sobre las minas de cobre de las rancherias de Mancayan, Suyuk, Bumucun y Agbao*. Manila (1862), 18.

finger in the shape of a dog; the comandante insisted that he wanted the gold they had promised him and that they must find enough to enable them to make it the size of a puppy. They got together all the gold that the people of Masla and Sumadel had, and made it in the shape that the Spaniard told them, but still they had not enough gold. Then Quabang asked the Payeo people, as a favor to him, to give him some gold and thereby their towns would make friends and forgive the wrongs that they had done them. The Payeo people gave Quabang two pairs of earrings, but still there was not enough; then Quabang gave to the Spaniard his unmarried sister, by the name of Dayeman, whom the Spaniard took away with him, and who has never returned to her home. Before the Spaniard went away, he appointed Paguien *maestre de campo* for Payeo and ordered him to Vigan to receive his instructions from the authorities there. About a year after they decided to go to Vigan, but they thought that Buluan should go to Vigan and take the place of Paguien as *maestre de campo*, because Paguien was a small man and thin and it would be a disgrace to them, while Buluan was a big man—fat and big headed—and his eyes were like the eyes of a carabao. They did so, and when they arrived at Vigan Buluan appeared there as *maestre de campo*. The authorities then told them that if possible they should quit their head-hunting. From that time on, Buluan was known as *maestre de campo*. Upon their arrival home, Buluan made a trip to the neighboring towns and invited them to make peace with each other; peace was established with all the towns that he visited. Later on he made another trip to Tanobong, taking with him Olbanes, Macon, Cangoy, Pacodan, and Logsing, with the intention of visiting the towns in the eastern country, but on their way they were met by Busos from Mainit who killed Buluan, the *maestre de campo*, Olbanes, Macon, and Cangoy. Pacdogan and Logsing made their escape and ran back to Payeo for help; all the men of the community started at once in pursuit. When they arrived at the place the Mainit Busos had gone, but they found the bodies of their companions and took them back to Payeo. About a half a year after, a *comandante politico militar* arrived at Cayan, and the Payeo people complained to him of the murder of Buluan and his companions; the comandante sent soldiers to Mainit, but the soldiers found nobody there, so they burned up all the houses that were in Mainit.

The town of Payeo was reduced to a *barrio* the same time as Besao; it was part of the town of Besao, originally. Many years after it was reduced to a *barrio* we succeeded in having it organized into a town again and were then separated from Besao again; a *gobernadorcillo* and other subordinate officials were appointed for Payeo. We were a separate town for more than four years, when we were again annexed to Besao; after many years we were again separated from Besao and formed into a separate town. When the American Government established the provincial government in Lepanto, we were again annexed to Besao as a *barrio*.

#### BARRIO OF PADANGAAN

The original families of the *barrio* of Padangaan and their lives, as told us by our forefathers, are as follows:

Quindaguen and his wife Palonet from Payeo were the original people that settled at Padangaan; they had planted a piece of land there with

camotes and other vegetables, so they went and made their home there; while there they had 5 children, 3 boys and 2 girls. Smallpox then broke out at Payeo; the people there were very much frightened over it, because that was the first time that that disease ever appeared among them; consequently a good many of the Payeo people moved to Padangaan; in this manner Padangaan became inhabited and so Padangaan is the offspring of Payeo.

In 1902, Padangaan became a barrio of Besao. A short list of its officials since that time and the names and marks of the old men consulted follow.

#### BARRIO OF AGAUA

The original families of the barrio of Agaua, as it has been told to us from generation to generation are as follows:

Bodoos, Seppa his wife, and his two daughters, from the rancheria of Fidelizan, of the town of Sagada, had a she hog who went to have her pigs at a place called Agaua. That was before anyone lived at that place. Bodoos went after her but he did not succeed in getting her home, so he built himself a little hut there in which he lived while taking care of the hogs. While there, he noticed that the place was good for planting, as it was swampy; therefore, he decided to make their home there; he brought his family over and they were the first settlers in Agaua. When Bodoos's daughters, who were named Bal-i and Canopa, had grown up, they married two young men, one from Fidelizan, named Pag-ha, and the other one from Tubo, Abra, named Tobtaben. Pag-ha married Bal-i and had 2 sons by her, who were named Basicon and Pilingen; Tobtaben married Canopa and had 3 children by her, 2 boys, Olao and Atioag, and 1 girl named Dal-ling. When the sons of Pag-ha and Tobtaben grew up to be men, they went to Fidelizan to get married; Fidelizan is not very far from Agaua, only a mountain separating the two; after they had all got married, they returned to Agaua with their wives; in this manner the population of Agaua increased also by many people coming from other places.

Lists of the officials of the barrio follow. The barrio was at first annexed to Sagada, and in 1908 it became a part of Besao.

#### VARIOUS EVENTS

During Domeguias's time as gobernadorcillo, the towns of Mainit, Guinaang, and Dalican made a combined head-hunting trip to the town of Agaua, without any cause whatever that the people of Agaua were aware of. They killed 11 people, and the rest of the Agaua people, not being able to hold their own, ran away; then the head-hunters plundered the town and took everything away with them, as palay, putic (jars), brass gongs, hogs, and everything that they could find, after which they set fire to the town and not a house or granary was left standing. The people escaped in all directions, some went to Besao, some to Payeo, others went down to the coast and to other places. Five months after this incident, Domeguias, the gobernadorcillo, called all the people back to Agaua; some returned and others remained where they had made their homes by that time. When they had rebuilt their town again, they thought that they

would take the matter up with the authorities. So Domeguias, the gobernadorcillo, and others went to Vigan to see the civil governor. After Domeguias made his complaint to the governor, the governor sent for the comandante politico militar of Bontoc, in whose jurisdiction Agaua was at that time, and transferred the complaint to him. The comandante politico militar and Domeguias then returned to the mountains; on their way the comandante horsewhipped Domeguias and would have killed him had he not succeeded in making his escape. The comandante whipped Domeguias because he did not make his complaint direct to him; he was angry and ashamed for being called to Vigan. After Domeguias ran away, nothing more was done about the complaint.

About that time the population of Agaua had increased considerably again and Agoyoc was appointed gobernadorcillo. Shortly after Agoyoc was appointed, the Guinaang Busos made another head-hunting expedition to Agaua in which they killed 9 people. The people of Agaua then made a complaint direct to the comandante politico militar of Bontoc, and he had the town of Guinaang set on fire and burned up.

During the time of Malaggay as gobernadorcillo, the town of Sacasacan sent a head-hunting expedition against Agaua and killed Pagdang while he was getting firewood in the nearby mountains. And while Somilep was gobernadorcillo, the Guinaang people killed a man by the name of Diaoyao, of Agaua, while he was hunting in the mountains above the town.

While Docal-las was gobernadorcillo of Agaua, the Dalican people killed Anamong while he was working in his rice fields and then entered the town and killed 2 more people.

During Masidong's time as gobernadorcillo, the Mainit people killed Banganay and Duquey while they were planting camotes.

When Baygo was gobernadorcillo, the Sadanga people killed Bandido and Paquio while they were cutting rice at Libo.

While Odas was concejal of Agaua, the Tococan people killed Pampamayan at Bontoc, where he was studying in the industrial school.

All the above-mentioned events have taken place just as they are related and we witness it with our signature. [The signatures and marks follow.]

#### BARRIO OF BANGUITAN

We, the old men of Banguitan, herein relate the origin of the first people that settled in Banguitan, as accurately as it has been handed down to us by our forefathers.

Gayaman and his wife Pingan, together with 5 more families from Dalican, Cayos, in the confines of Cervantes, went to make their homes in a place called Cablad, in the confines of Besao; they emigrated from their town, Dalican, because they were afraid of other enemies, as many of their townspeople had been killed by Busos. During the first year that they lived at Cablad, they were engaged in herding their swine; one of Gayaman's hogs gave birth in a forest near Cablad. After Gayaman found her there he built a house for himself to live in, while he was taking care of his hogs; later on his wife came to live with him there, and then they decided to remain there and make that their home. This place was known as Banguitan. Their relatives, still living at Cablad, finally came to make their home at Banguitan also. In this manner the barrio of Cablad became abandoned and Banguitan became settled and the people are living there to



this day. The above-mentioned people are our forefathers, the original families of this barrio. We are, however, unable to find out the origin of each of us living here; neither do we know in what year our town was made into a barrio; we only know that when a gobernadorcillo was appointed for Besao, we were annexed to it and a cabeza de barangay, who is considered as the father of the barrio, was appointed.

Lists of officials of various periods follow. At one time the barrio was annexed to the municipality of Bagnen, but in 1908 it became a part of Besao.

COMMON CUSTOMS AS THEY ARE OBSERVED ALL THROUGH THIS TOWNSHIP

*Birth of a child.*—The husband of a woman that is pregnant and about to give birth cannot do the following things: (a) Plant bananas; (b) erect a post of a house; (c) cut down a tree. When the child is born, the father must not do the following: (a) Build walls; (b) cut down trees; (c) lead carabaos, cattle, or horses; (d) wade a river in going to another town before three months have past; (e) climb a tree or to the top of a house until the child has teeth.<sup>18</sup>

*Marriage customs.*—The parents of the young man and woman, after they know that their son and daughter wish to marry, call all their relatives together and kill a suckling pig. When they are about ready to eat, the father of the girl goes to the young man's house and takes him to the house of the girl. On their way back, they watch very closely for rats, alligators, or snakes; they also look carefully for a hawk or a crow flying over them. If they see any of these animals, the wedding is postponed for that day. If they see any of these animals for the second and third time, the young man and girl are not allowed to marry each other. During the first year of their wedded life, the husband cannot go to another town, especially if he has to cross a river.

*Wedding.*—After a man and woman have been married a year, a big wedding feast is prepared, for which they kill carabaos, cattle, horses, hogs, dogs, and chickens, according to the property. For two days after this feast the married couple must not eat anything. The young girls of the town stay with the wife and watch her for seven days and nights, in order that she may not sleep with her husband. For three years she must not go into another town; also she is not allowed to do the following things: (a) Eat in another house for five months after the wedding; (b) work on walls; (c) chop on a live tree; and upon going to another town for the first time she must kill a chicken upon her return.

*Customs at the death of a person.*—When a person becomes seriously ill, the parents or relatives kill 2 hogs and have a cañao. The moment that the sick person dies, they kill 2 hogs again. Two hours after the death another hog is killed. They recline the body against the ladder of the house and wail and cry over the dead. After their lamentations are over, they kill a chicken, and when they are about to bury the dead another chicken is killed. After the burial a she hog is killed; two days after the burial another chicken is killed; and a month after the death another hog will be killed; after four months, 2 hogs and 3 chickens are killed; three months

<sup>18</sup> See Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 59–62] for a discussion of childbirth and care of children among the Bontocs.

after this caña, 1 hog and 2 chickens are killed again; four months after this, they kill 3 hogs and 2 chickens; they wait four months more and then kill 1 hog and 2 chickens more. After all these ceremonies are over the parents and relatives can depart, but if they should live in another town and there is a river to cross they cannot cross for a year.<sup>79</sup>

*Customs in the building of a house.*—When a man has started to chop timbers to build a house for himself, he cannot go to another place or town until the house is completed. When he builds his house, even though it is raised already, and he digs up a toad, rat, snake, or other animal, the house is moved to another place. Also, should it rain or should a rainbow appear in the sky, while the house is under construction, or a crow or a hawk fly over it, the house is moved to a different place.

The foregoing is a description of our customs that we have inherited from our forefathers.

#### CAYAN<sup>80</sup>

The barrios of the township of Cayan are Cayan, Tadian, Balaoa, Lubon, Masla, Sumadel, and Tue. "In 1844, owing to the great many dangers that threatened this town, arising from the hostilities of neighboring towns, from the stealing of their cattle, hogs, chickens, etc., and from being compelled to pay tribute to other towns, the people decided to go to Bucay, the former capital of Abra, and request the authorities there that a Spanish official be sent to their town." Thereupon Spanish-appointed officials were established in Cayan, which became the

<sup>79</sup> Of mortuary customs among the Igorots, Quirante [Blair and Robertson, *ut supra*, 20, 274, 275 (1624)] says: "When one of those barbarians dies, they do not bury him for many days, for, as they say, they pass one month, during which period they amass quantities of food about the deceased, to whom they give his share as well as the others. Then they continue to prick the body, and, as they say, they draw off or suck out the humors until the body is left dry. When that time comes they wrap it in their blankets, and fasten *buyos* (betel) and other things about the waist for the journey. Some are buried in a sitting posture and placed with their backs against their shields, in caves under the rocks, the mouths of which are stopped with stones. Others they set in the trees, and they carry food for so many days after having left them in either one of those places." Compare other mortuary customs of Philippine peoples in Blair and Robertson, *ut supra*: 5, 129-141 (Loarca, *Relation*, ca., 1580); 7, 194-196 (Plasencia, *Customs of the Tagalogs*, 1589); 16, 133 (Morga, *Sucesos*, 1609); 40, 79-82 (Colin, *Labor evangelica*, 1663); 40, 165, 166 (Combés, *Historia*, 1667); 40, 337-339 (San Antonio, *Chronicas*, 1738-44). Compare also the ceremony among the Ifugaos described by Beyer and Barton, *This Journal*, *Sec. D* (1911), 6, 227-249; among the Bontocs in Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 74-80. See also Worcester, *This Journal* (1906), 1, 850; Perez, *Pub. P. I. Ethnol. Surv.* (1904), 1, 201; and the manuscript *Memoria aprocsimada*, *op. cit.*

<sup>80</sup> For a description and partial history of Cayan, see Perez, *Igorrotes*, 153-162. It is located 9 kilometers from Cervantes.

capital of Lepanto. In 1883, Luis Sarela <sup>81</sup> became the chief official. "He took great interest in the people and in their future welfare; he ordered the planting of potatoes, cabbages, beans, cacao, coffee, mangos, and other fruits." The people, however, paid little attention to the order, and a penalty of imprisonment or whipping was imposed for neglect. In 1883, the capital was transferred to Cervantes, as Cayan lacked good building sites. The first friar missionary entered Cayan in 1881, and the first teacher was appointed in 1885. Lists of the officials of the various barrios are given. The following customs are described:

#### CUSTOMS OF THE PEOPLE

The cañao that is celebrated by the whole town is called *begnas* <sup>82</sup> which is celebrated twice a year, before the rice planting and the rice cutting time; this is the biggest cañao that is held by the whole town; it lasts from two to three days, during which the people dance, play *ganzas*, and sing. This cañao is held to ascertain whether the rice crop will be a good one or not; they tell it by the gall of the hogs that are killed for this cañao; if the galls are big and full it is a sign that there will be a good crop, but if they are small and empty it is a sign that the crop will be small; <sup>83</sup> during the time that the hogs are killed no one from the town is allowed to go out anywhere, nor is anyone from another town permitted to come into the town.

The cañaos that were handed down to us from one generation to another by our forefathers are called *bayas*, *baquid*, *obaya*, and *palis*.<sup>84</sup>

*Bayas* is a cañao in which 4 to 6 hogs are killed, also *carabaos*, cattle, and horses; that is, if the people are rich. They sing, play on their *ganzas*, and dance. The persons that celebrate this cañao cannot leave their houses for nine days and they cannot go to another town for three months. (This cañao is held by married people, and is celebrated only three times by the same persons.)<sup>85</sup>

*Baquid* is somewhat like the *bayas* cañao, but in this cañao *ganzas* are not played, nor do they sing or dance; it is only held once a year. (This cañao is held for the dead.)

*Obaya* is a cañao in which a hog is killed; no *ganzas* are played in this cañao; the old men come together and eat; after a while they all go back home again. (This cañao is for the purpose of finding out anything that happened in the town, such as the discovery of a thief, etc.)<sup>86</sup>

<sup>81</sup> Luis Sarela y Figueroa became *comandante politico militar* of Lepanto in February, 1879, and governed the district until August, 1883. Besides moving the capital, he encouraged education and built a trail from Cervantes to the boundary of the district. See Perez, Igorrotes, 58, 59.

<sup>82</sup> See footnote 16.

<sup>83</sup> See footnote 31.

<sup>84</sup> Compare this account with that on page 489.

<sup>85</sup> See footnote 44. The ceremony here described is similar to the *Ifugao bumaiyah*.—BEYER.

<sup>86</sup> This ceremony is the same as the *Ifugao ubaya*.—BEYER.

Palis is a cañao in which a hog is killed at night time; they beat the drums and sing; this cañao is held for the sick, in order that the people afflicted with enlarged intestines, the poor, and pale and weak people may be cured; the next morning they kill another hog which they call *sabusab* (meaning the end of the cañao). These are the only cures for sickness that the people believe in.

## SICKNESS

When a person gets seriously sick, the parents or relatives send for an old woman, who is called *baylan* (priestess). This woman prays to the anito and then speaks to the sick person, in a trembling voice, saying, "We have caused you to be sick because you have failed to offer up to us our customary sacrifice (a hog or a chicken); we have made you sick, so that from now on you may not forget again; we may not only make you sick, but we may kill you also." The patient then answers and says, "Yes I will sacrifice to thee all thou asketh; though I have it not, I will find it, but I pray thee, restore my health to me again." In the meantime the parents or relatives prepare a coconut shell of tapuy over which they pray and say, "If it be true, that thou, the anito, hast made him sick, we pray thee to restore him again to health so that he will be able to make the sacrifices that thou hast asked of him." If the anito, so prayed to, is the one that made the person sick, the patient will get well as soon as the sacrifice is offered; if the patient does not get well, another old woman is called, who goes through the same ceremonies as the other one; this is kept up until some old woman baylan finds the anito who made the person sick."

## SETTLING QUESTIONS AND COMPLAINTS

Old men only, who have reached a certain age, are allowed to take part in the settling of disputes and complaints of their townspeople. As soon as a complaint is made, the old men are called together to investigate the complaint. A dog and 2 chickens, of the same size and color, are prepared. The 2 chickens represent the 2 litigants; the chickens are killed by beating them with small sticks; then they are held over the fire and partly roasted, with the feathers on;<sup>87</sup> after that they cut them up and take out the gall. If the galls of the chickens are of equal size, they counsel the litigants to make a friendly settlement, which will settle their dispute forever. The dog and the chickens are then cooked and eaten. The litigants pay for them as well as for other things that are used up during the settlement of their question. Should the galls be of different size, the one whose chicken has the larger gall loses the case. The old men then will inform the one whose chicken had the larger gall that the case has been decided against him; then he will be obliged to make good whatever there is stated in the complaint. For instance, if he had stolen a horse, he would have to return the horse or make good in some other

<sup>87</sup> Cf. Blair and Robertson, *ut supra*; 5, 129 (Loarca, Relation, ca. 1580); 40, 336, 337 (San Antonio, Chronicas, 1738-44); 43, 108, 109 (Ortiz, *Práctica del ministerio*, ca. 1742); 43, 310-319 (Present beliefs in Luzon, 1905).

<sup>88</sup> The object of holding the chicken over the fire is to burn the feathers off—*ilágim*.—BEYER.

way, with money or another horse, and the same way with cattle, carabaos, or hogs. The old men who take part in the settlement of a case are responsible and have to answer for everything, should the same case ever come up again. Questions can only be settled in the aforesaid manner, when the litigants are not in any way alike in age, stature, or in any other manner; but if they are of about the same age, height, etc., the old men put a sharp piece of iron on each litigant's head inserted to the depth of 2 or 3 millimeters, and he that bleeds less wins the case. Should the party who lost the case not be satisfied with the old men's decision, he has the right to call in the old men from a neighboring town; when they arrive, the old men that decided the case will also be called together. The old men from the neighboring town speak first; they state their arguments and ask that the question be reopened and the decision given be revoked and given according to the petition of the man against whom the case was decided. The old men that decided the case in the first place say: "Our decision stands good, because we decided it by the gall of sacrificed chickens that showed that he is the guilty man, but if you insist that the decision be revoked first restore to life the dog and the chickens from which the galls were taken, before we can give another decision."

After the old men have questioned both the litigants, they make them take an oath of the most horrible nature; such as, "May your belly swell up, from which you will die if you have declared falsely;" or, "May you become blind, if what you have spoken be false;" "May you be eaten up by a boa, if you did not speak the truth." The old men set fire to a bundle of pine wood, split into small pieces, which they then stick into a shell full of tapuy. At this the litigants answer, "I swear," accompanied with howls and shrieks, signifying that he who lied will be punished by the anito according to the oath that he took."

The expenses, including the cost of dogs and chickens, incurred in the settlement of questions are paid by both the litigants."

#### CERVANTES <sup>91</sup>

Cervantes is the capital of Lepanto. Seven barrios belong to it; namely, Concepcion, Rosario, and San Juan, inhabited by Ilocanos and other Christians; and Dain, Malaya, Brooke-Dinwiddie, and Pilipil, inhabited by Igorots. In 1908 Cervantes had

<sup>90</sup> Cf. Colin, *Labor evangelica*, 1663 (Blair and Robertson, *ut supra*, 40, 78, 79), who gives the following forms of oaths used by the Filipinos at the time of the conquest: "May I die;" "May I be eaten by the crocodile;" "May I turn into a monkey." "When the chiefs of Manila and Tondo swore allegiance to our Catholic sovereigns, in the year one thousand five hundred and seventy-one, they confirmed the peace agreements and the subjection with an oath, asking 'the sun to pierce them through the middle, the crocodiles to eat them, and the women not to show them any favor or wish them well, if they broke their word.'"

<sup>90</sup> See page 518. The expenses may be regarded as the fee paid by the one losing the case.

<sup>91</sup> For description of Cervantes, see Perez, *Igorrotes*, 115-124. Cervantes is called by some an Ilocano town, because of the numbers of that race living there.

3,787 inhabitants, of whom 1,705 were Christians and the rest Igorots. The account of Cervantes sent to the Philippine Library was written in 1908 by Sabas Gaerlan, a native of Tagudin, who had lived in various parts of Lepanto since 1873. His manuscript shows that he had received a fair education. The account is simply and charmingly written, and all of it deserves publication. Space and the main subject in hand, however, permit only the following excerpt to be made:

OTHER CUSTOMS OF IGOROTS

When an Igorot wants to celebrate a fiesta or perform a cañao once in four or five years, he kills many hogs, carabaos, and cattle, and calls in all the rich men from neighboring towns and all the poor people in his own town. This fiesta is performed so that he may be honored by his visitors and all who know him. When the cañao is begun all the hogs to be used are gathered together and the carabaos and cattle are all tied up to trees. They dance accompanied by ganzas, and make an offering and ask Cabunian<sup>92</sup> (God) to favor the man performing the cañao and to give him good health, and pray to the anito and the souls of their dead ancestors not to destroy his plants and not to kill his animals so that he may use these animals to perform another cañao for them (another cañao for the anito); this is the custom of the people in Malaya. The people of Dain and Pilipil have another name for this cañao bayas,<sup>93</sup> and it is performed with ganzas before they kill the hogs; first they drink tapuy on the day when the visitors arrive, and the next day they kill the hogs, carabaos, and cattle that they have prepared, and after this, one old man makes an offering to Lomaig (God)<sup>94</sup> to give good health, good thoughts, and customs to the rich man that performed the bayas; and the old man also calls the souls (anito) of their dead ancestors to help them in praying

<sup>92</sup> See footnote 40.

<sup>93</sup> See footnote 44.

<sup>94</sup> See Beyer [*This Journal*, Sec. D (1913), 8, 96 and 97] for Bontoc stories of Lumáwig. I am indebted also to the same authority for the following: "Lumáwig is a famous Igorot, Bontoc, and Ifugao culture hero. He is only one of many ancestral deities. Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 174, 200-204, 216, 217] is in error in speaking of Lumáwig as a supreme being." Lillo de Gracia, Distrito de Lepanto, recites a story of Lumáwig. His wife is Bañgan, and the two children, Ubban, the boy, and Bugar, the girl, or Cabigat and Suyan. A sample of the manner in which the missionaries were able to turn the old stories to account is related by Perez, Igorrotes, 142, note: "Father Rufino Redondo says, 'Making use of their beliefs (since they worship four gods called Lumaug, Bugar, Cabigat, and Bañgan), I informed them that we also worship God (one and triune), and that Bugar, the wife of Lumaug, is no other than the most holy Virgin Mary, spouse of the Holy Spirit, and Mother of the Eternal Word. I ended my talk by exhorting them to obedience and submission to the Spanish crown.'" [The apparent inconsistency in the names mentioned in the above quotations is probably due to the fact that the authors cited obtained their information from different persons or in different clan districts.—BEYER.]

to Lomaoig that he may give a better living or whatever they have asked and that they may have sufficient of everything when they have their *bayas* (cañao).

It is a custom of the people in the same barrios to have a cañao which they call *pacde* or *begnas*, either before or after working or harvesting; this is for all people, and it is performed in the *abong* (tribunal). The ceremony that they perform is the killing of a hog, but if the gall of the hog they killed is not good they kill another and continue to do so until they meet a good and full gall. As soon as they see that the gall of the hog they killed is good, they cut the hog into pieces after it is burned and ask Lomaoig or Cabunian (both Gods) to give them a good crop. If it is time for harvesting, or for good luck in the planting, they perform *pacde* or *begnas* before they begin their work. No one can go to work the day just after the cañao, and they are [not] allowed to go to the country to work [until] three days after the performance of *pacde* or *begnas* if the gall of the first hog they killed is good and full, but if they had to kill [two] or three times they are longer delayed in being allowed to go to the country to work and it will [be] five or six days then before they are allowed to do any work.

If any one of them falls sick, it is their custom to call an old woman to make the cañao, and if she says that 1 hog is needed the parents or relatives of the sick person must kill 1 hog; if the *anito* says that they must perform *bayas*, they must do it, and if he says that they must perform *tobag* they must do it also. The ceremony for *tobag* is the killing of a hog which they offer to Cabunian in order that the sick person may be cured. If one of them dies, they must kill a hog, and if the gall of the hog is good and full they bury the dead; but, if the gall is not good, they kill another hog and keep on doing so until they find a hog that has a good gall. The dead person is kept in the house for two or more days or until they find a good gall; after the dead person is buried, and before the separation of the visitors in front of the dead house, an old man relates a story and says: "There is Cabunian or Lomaoig looking at the level land where he puts the people who do not know their homes and are cruel. 'I make the earth sink,' he says and 'I again make other mountains.' The world is flooded, and after the water becomes low there are the mountains; two people are left, a man named Gomatan and a woman named Bangan. Gomatan lived in Gangyango Mountain, a part of Malaya, and Bangan lived in Caoitan Mountain, a part of Ifugao, Banaue. When Gomatan saw a fire in Caoitan Mountain he went on a small wooden raft called *salibao* (drum used by the Igorots), and when they saw each other they were brother and sister. They waited in Caoitan until the water became small, and there they saw the other mountains and rivers. Cabunian saw them there and went and married them, though they did not want to get married; but Cabunian took a *runo* (stem of a large grass) and split it and then he put them close together and said: 'This *runo* is only one, but can be divided into two and can be joined together again; you, Gomatan and Bangan, get married and become father and mother of many people.' The people increased in number and they did not bury the ones who first died; then Cabunian came down to the earth and told the people that the dead may not become obnoxious and 'After burying the dead you should make prayers and offerings so that you may not be affected by any kind of diseases.'

After they make a prayer or offering, they go to some running water and bathe themselves and after that all the people may go home."<sup>96</sup>

#### CONCEPCION <sup>96</sup>

The township of Concepcion has 6 barrios, as follows: Alfonzo, Ananaao, Concepcion, Sigay, Mateo, and Tubaline. After giving the lists of officials for these barrios, the manuscript continues:

#### HISTORY OF THE PEOPLE, THEIR CUSTOMS, AND LIFE

The first condition of a child when he is born and the things he does until the end of his life are the following:

When a child is born, the old men or women perform a caña which is observed as an offering to God so that the child will have a successful life in the future. The ceremony they observe in this caña is the killing of a hog or a chicken.<sup>97</sup>

The parents of the child, whether he is a boy or a girl, when he becomes one or two years old, make an agreement with the parents of another child of another family to marry these children, but sometimes this agreement is not carried out.

When this child, boy or girl, is about 10 years old and can do any kind of work, the parents let him go to any place where he can earn a good living or he helps his parents to find food for the family.

As the boy reaches the age of 18 or less, he wants to get married and begins the performances of some cañas according to the Igorot customs.

When this boy becomes a full-grown man, and old enough to think of the future, he builds himself a house to live in. This married couple diligently work to find enough provisions for their living and they often do the same thing as their parents did, according to their customs; this married couple, though they were united together or living in the same house, have not the right to get the dowries given by their parents, unless the wedding ceremonies are celebrated.

When the husband and the wife want to get the dowries from their parents they tell the old men (principales) of the town that they will celebrate their marriage. The parents of both must agree to it, together with the old men of the town. The day before the marriage they prepare all the things needed for the wedding.

After the preparations are made they summon the people to come to attend the marriage ceremony. On the wedding day there is much happiness, and the husband and the wife as well as the visitors are full of joy. On this day the parents of both bequeath some property, such as lands, animals, house, and other things, to the married couple. In this

<sup>96</sup> One Igorot version of the flood and the new creation. Compare with the similar story in Beyer, *This Journal*, Sec. D (1913), 8, 96. Note that in the Bontoc and Igorot story there is the same reluctance of the brother and sister to be married. Compare also the Ifugao myths related by Beyer, ut supra, 100-102, and 111-113.

<sup>97</sup> Concepcion was formerly a part of the district or comandancia of Bontoc. See Perez, *Igorrotes*, 245-247.

<sup>98</sup> See footnote 78.



case they make out no receipts showing the property given to the husband and the wife; they only give the document of such property to the married couple.

After the marriage of the husband and wife they must build a house of their own and they themselves secure their own food.

Now if one of them dies and they have a son he will inherit their property; the son himself has the only right to keep all their property.

But if one dies and they have no son to inherit the property, the property that had been awarded cannot be given to the one left until the end of the offering done by their relatives according to custom.<sup>98</sup>

If the married couple had accumulated or earned property besides the awarded property, that property will be divided between the two of them.

There are other habits or customs inherited from our forefathers that we can hardly relate, especially the customs regarding the Igorot cañao.

#### HISTORY THAT TELLS HOW THE QUARRELS OF THE HUSBAND AND WIFE ARE REGULATED

It is the habit of the married couple, when they have a quarrel and want to be divorced, that the case is told to the old men of the town who assemble at the abong. They talk about it, and the husband and wife are forced to agree and be united together again. During this, the old men in the abong, who are settling this case, compel the married couple to kill a goat or a hog which the old men will eat as their punishment [that is, of the couple] and in payment for the good advice given by the old men. If it is not agreed that the husband and wife be united, the married couple are sent to the tribunal (presidencia) to settle the question.

#### STORY OF A MAN WHO IS A WRONG DOER, SUCH AS ONE LIVING IN CONCUBINAGE (A MAN WHO LIVES WITHOUT BEING LEGALLY MARRIED), AND THIEVES

If a man is found to be living in concubinage, it is our custom not to complain against him to the tribunal (presidencia), but we gather all the old men, principales, of the township regarding this matter; the old men advise him not to do this same thing again. In this meeting or assembling of the old men a goat or a hog must be furnished, and they eat it according to their customs. But, if he is found doing the same thing again, he will be complained against before the tribunal.<sup>99</sup>

Now, if there is a man found who stole something, he will be counseled just the same as in the case of concubinage and be forced to return to the owner the thing he stole from him; he must suffer the punishment that the old men impose together with what advice they may give him. Such a case will not be reported to the police or to the justice of the peace if it is the first time that the person has stolen something, but if he does it again

<sup>98</sup> Compare the inheritance customs as described in Blair and Robertson, *ut supra*: 5, 153 (Loarca, Relation, ca. 1580); 7, 181, 182 (Plasencia, Customs of the Tagalogs, 1589); 16, 125, 127 (Morga, Sucesos, 1609); and in Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 164, 165.

<sup>99</sup> Cf. Blair and Robertson, *ut supra*: 5, 177-179 (Loarca, Relation, ca. 1580); 7, 182, 187 (Plasencia, Customs of the Tagalogs, 1589); 16, 126 (Morga, Sucesos, 1609). See 5, 125, for the Visayan myth of the origin of concubinage.

we will have the right to complain of him to the tribunal or the justice of the peace.

STORY OF THE METHODS OF BUILDING THE HOUSES AND HOW WE WORK  
ACCORDING TO THE CUSTOMS INHERITED FROM OUR FOREFATHERS

When an Igorot wants to build a house, his neighbors are willing to help him without pay; when the house is finished, the owner of the same will not go to live in it without first performing a cañao and after the cañao he will live in the house.

We can't begin any work unless we kill a chicken, which is used as an offering in order that we may do the work fortunately.

MANCAYAN <sup>100</sup>

From the document for the township of Mancayan, the following excerpts are taken. The township contains three barrios; namely, Aban, Suyoc, and Cabali. The stories of the formation of the three settlements are similar. The customs of all three are identical. For Aban and Suyoc, the narrative of the functions of campo and medes and of the trial by ordeal, called pudong, are given word for word the same. That for Cabali is abbreviated. For all three, short accounts of Spanish and American rule are given, but as they have no special bearing on the main subject they are omitted here. The story of the discovery of copper occurs in the narrative for Aban, and that of gold in the narrative for Suyoc.

ORGANIZATION OF THE PUEBLO OF ABAN (MANCAYAN) IN TIME IMMEMORIAL

The old men of the above town, by name Cacamo, Lasbaquen, Dagacen, Mullones, and Bayed, and the old women, Bangayan and Guiling, state that the persons Tibaldo and his wife Alummay, Magagneo and his wife Cupit, Cumacom and his wife Gueyna, Lagdingan and his wife Budeas, Agaguen and his wife Dapunay, Bilasi and his wife Tampacao, Disamoy and his wife Tabollo, Tiab and his wife Bacluya, and others whose names we do not remember, and who came from very distant rancherias, are the ones who formed the pueblo of Aban in time immemorial. They divided Aban into 4 barrios, according to the centers of population, the names of which are

<sup>100</sup> For a description of Mancayan and Suyoc, see Perez, Igorrotes, 125-140. See also Eveland, Preliminary reconnaissance of the Mancayan-Suyoc mineral region, Lepanto, P. I., *Bull. P. I. Bur. Min.* (1905), No. 4; and Santos, Informe sobre las minas de cobre de las rancherias de Mancayan, Suyuk, Bumucun y Agbao. Manila (1862). The last-named treatise is the first comprehensive geological report on the mining region of Lepanto. See also Hernandez, Reconocimiento de un criadero de cobre en el Monte Aban, termino de Mancayan (1850); von Drasche, Fragmente zu einer Geologie der Insel Luzon. Wien (1878), 36-45; its translation into Spanish, Datos para un estudio geológico de la isla de Luzon. Madrid (1881), 41-50; Memoria . . . de la sociedad Cantabro-Filipina de Mancayan. Binondo (1871).

Balili, Tuboc, Banaba, and Aban. These were the fathers and grand-fathers of those who make these statements.

The wealthy old man Tibaldo, who was called campo, was headman of this pueblo, and in each barrio was a wealthy old man of the same barrio who was called mede.<sup>101</sup>

The names of those who have been medes that are remembered are Bang-oaṅdan, Aguelba, and Quioaen.

Those appointed held those offices [of campo and mede] for an unlimited period, and were only succeeded when the pueblo or barrio so decided, and were relieved by a son or other member of the family.

The medes [each] had in their barrio an ato (kind of court), a small building in which the entire barrio assembled, headed by the mede, in order to discuss the affairs pertaining to the barrio. (Plate II, fig. 1.) The medes communicated these matters to the campo. The latter thereupon assembled all the former in one of the atos, and the matter was discussed in order that he might give his decision. The campo could not decide any matter without the approval of one or two medes, although he believed his decision proper and necessary. There were matters that were decided by the medes, if they formed the majority.

At present this court is involved at times in family disputes and in the case of debts, and is held as follows: Any person appears before the mede and makes a complaint against another person for debt. The mede thereupon sends word to the other medes to assemble in the ato. They summon the defendant, take the declarations of the two litigants, and as soon as the defendant has been declared guilty sentence is given and the sentence communicated to the defendant, with a fine which is imposed of a hog or other animal, and of tapuy, which are consumed by all [the medes] and by those present. Furthermore, he is forced to pay double the debt. If the plaintiff loses the suit between himself and the defendant, he has to give a hog and tapuy, which are consumed by all the people as above said. In cases in which the plaintiff and defendant maintain their positions obstinately because of a strong denial on the part of the latter, the medes oblige them to take the pudong. This is a kind of examination and proof, and is conducted as follows: The medes and old men prepare a small bit of [sharp] steel, and a bamboo through which the steel can pass easily when let fall through the hollow. While the above objects are being prepared, other old men proceed to sacrifice chickens, at the same time praying to their gods to aid them with the litigants, as each one [of the gods] may desire. When everything is ready, the above-mentioned litigants are made to squat on the ground on their heels. As soon as they are in position, he who is about to perform the operation approaches. This is usually an old man, and [there is] another one who acts as witness or assistant. The former places the bamboo on top of the head of one of the above-mentioned litigants and drops the above-said piece of steel through the hollow of the said bamboo. This, through the force of its fall, makes a slight wound in the scalp, from which oozes a small drop of blood. Then he does the same to the other litigant, also in the presence of the other witness or assistant. When the operation is ended, the medes and old men examine very carefully the drops of blood

<sup>101</sup> A note in this account later on defines campo as the headman of the pueblo and mede as the headman of the barrio.

on the heads of the above-said litigants, for the purpose of ascertaining which of the two has the greater amount of blood. That one is thereupon considered to have lost the case, and he is punished as above said.<sup>102</sup>

The presence of the campo is not necessary for all matters, unless he wishes, but it is necessary in the most important matters.

All the affairs of the pueblo and other very important matters could not be written, because we had absolutely no knowledge of paper, pen, and ink in those times, and we preserved all such matters by memory from family to family to our present time.

Short accounts of the Spanish and American régimes follow. Spanish officials were stationed in Mancayan from 1862 until the insurrection against Spanish rule. The manuscript continues:

#### DISCOVERY OF THE COPPER MINES BY NATIVES<sup>103</sup>

The men, Buansi, Gal-ey, Banggit, and two others whose names we do not now remember, the fathers and grandfathers of the declarants, and hunters in those early times, inhabitants of the old pueblo of Aban (Man-

<sup>102</sup> See footnote 64. Cf. Blair and Robertson, *ut supra*: 5, 145-147, 161, 181-187 (Loarca, Relation, ca. 1580); 7, 179 (Plasencia, Customs of the Tagalogs, 1589); 16, 128, 129 (Morga, Sucesos, 1609); 16, 321-329 (Plasencia, Customs of the Pampangos in their lawsuits, 1589); 40, 85, 86 (Colin, Labor evangelica, 1663); 40, 150 (Combés, Historia, 1663); 40, 357, 358 (San Antonio, Chronicas, 1738-44); 43, 109 (Ortiz, Practica del ministerio, ca. 1742); 43, 304 (in Mindanao).

<sup>103</sup> The copper deposits of this region have long been known. W. D. Smith of the Bureau of Science [*Journ. Geol.* (1913), 21, 29-61], says that the copper is found in the form of arsenates and sulphides. Eveland [*Pub. P. I. Min. Bur.* (1905), No. 4, 9] presents a good description of the copper fields together with a short bibliographical survey and a history of mining and the mining methods of the Igorots. See also the annual bulletin, *Mineral resources of the Philippine Islands*, published by the Bureau of Science. A Spanish company, called the Cantabro-Filipino Company, began operations in 1856. The company paid about 400 pesos Philippine currency for the concession, and the Igorots were guaranteed employment in the mines at regular fixed rates. It is estimated that 40,250 pounds of copper were produced during the years 1840-55, valued at 117,000 Spanish pesos. The company began the work of actual production in 1860. From that time until 1875, when the company ceased operations, 2,500,000 pounds of copper were produced. The copper mined by the Igorots is smelted by a primitive method probably learned from the Chinese. Eveland says (p. 18): "The copper obtained in this manner they sell partly in cakes to the Christian people in the lowlands, and partly dedicate to the manufacture of pots and boilers which the Igorots forge with stones; also making of the same metal bars, tongs, and small pipes for smoking." *La Guia Oficial*, Manila (1893), 115, says: "In the district of Lepanto are important copper deposits and considerable exploitation has occurred in Mancayan, Suyoc, Bumucun, and Agbao. The Igorots of the most distant mountains carry the mineral down to sell it, but they are hostile to whites, and no one has gone up." Worcester [*This Journal* (1906), 1, 848] says of the copper mining of the Igorots: "Many of the *Igorots* of northern Benguet and southern Le-

cayan), while out hunting one day, in the hopes of being able to catch a deer with their dogs pursued it for some hours. They had the good fortune to catch it in one of the places where to-day is found a hole of the mines of this above-mentioned pueblo. When it came time to prepare their food, the above-mentioned hunters agreed to prepare it in the place abovesaid. For that purpose they gathered some stones on which to do their cooking and on which they set their jar. Thereupon they set fire to the wood, and after several hours one of them went to the said cooking place to see whether the food was ready. He saw that one of the supporting stones had melted like lead. Thereupon all were astonished at the melting of the stone. Upon this they examined the above-mentioned stone and made several experiments with it. As a result they converted it into a substance dark red in color. This the aforesaid discoverers called *gambang* (copper).

After continuing their experiments for some months, the discoverers succeeded in obtaining a certain number of pieces of *gambang*. They resolved to make jars out of it, which they called *galang*. The rest they converted into lumps and took them to Tagudin (Ilocos Sur) to sell, before and now a part of Mountain Province.

After some years a commission composed of several Spaniards entered the pueblo. Among them were two whose names we remember yet, namely, Señores Don Mariano del Pielago and Don Evaristo, and an Englishman.<sup>104</sup> After another year, those men took possession of the copper mines, and told our ancestors that they had been given the title to those mines by the government. Thereupon, some of our abovesaid ancestors went to other pueblos, and others to other near-by places, and some remained as workmen for those men. In our days, this is our present condition. (Plates IV to IX.)

The organization of the pueblo of Suyoc is related. This is very similar to that of Aban, and the account of the pudong ceremony is word for word the same. The following is related:

#### DISCOVERY OF GOLD MINES BY THE NATIVES <sup>105</sup>

Daguioa and Al-laoas, the grandfathers of the declarants, one time when they went to the above-mentioned sitio of Palidan located within the

panto mine copper and smelt it by a process of their own. From the metal thus obtained they fashion *ollas* and kettles which frequently are of large size. The method employed in making kettles is kept secret by those familiar with it, and numerous attempts on the part of Americans to surprise copper-smiths at their work have proved abortive. At one time a considerable business was done in the vicinity of Suyok in making rude counterfeits of Spanish copper coins. Clay molds were taken from genuine coins, and into these molds the copper was run. These counterfeits, although quite recognizable as such, circulated freely for some time because of the shortage of small change." American claims were staked out in 1900. See also Santos, Informe, op. cit.

<sup>104</sup> Possibly the forerunners of the Cantabro-Filipino Company, or the company itself. See Eveland, *Bull. P. I. Bur. Min.* (1905), No. 4, 16-19; and Santos, Informe, op. cit.

<sup>105</sup> The Igorot gold mines have long been famous. As early as 1575, Gov-

jurisdiction of the pueblo, for the purpose of bathing, on arriving at the creek, took a bit of *unit* (wet earth that is used as soap for the head) to rub themselves with for the bath. One of them upon rubbing his head with the abovesaid earth saw that his hands had become tinged a saffron

ernor Guido de Lavezares, influenced no doubt by report of gold, planned and despatched an expedition to northern Luzon, but the undertaking had no result. In 1591, the energetic governor, Gomez Perez Dasmariñas, sent his son Luis, afterward acting governor, and two other expeditions to explore the so-called province of Tuy. In 1594, Luis Perez Dasmariñas despatched Captain Toribio de Miranda to the same region. See Blair and Robertson, *ut supra*, 14, 281-326, for an account of these early expeditions. Pages 301-307 relate "What has been known from old times, in these districts, of the rich mines of the Yglotes [that is, Igorots] both from seeing the great amount of gold that the Indians of those mountains have extracted without skill, and are still obtaining, and which they sell to the neighboring provinces, and trade for food; and by persons (Spaniards as well as Indians) who have been in the mines opened by those mountaineers." As early as 1624, the workings of the Igorots appear to be very old, and many of them were already abandoned. An engineer conversant with Chinese methods of mining told me recently that it was his belief that the Igorots had learned their methods from the Chinese. See Becker's account on native methods of mining in *21st Ann. Rep. U. S. Geolog. Surv.* (1901), III, 576-680. Quirante writing in 1624 (Blair and Robertson, *ut supra*, 20, 276-279) says that the Igorot men, women, and children were accustomed to wash gold in the small mountain streams during the rainy season. This was traded in the lowlands for cattle and other animals by its quantity as determined by sight instead of by weight. Quirante says that the natives had five hills where they had tapped the gold-bearing quartz rock, although they obtained but a small amount of the metal. The workings as described by Quirante appear to have been rather extensive. Their tools he says were "certain stakes of heavy wood fashioned like pickaxes, with the knot of the said stake larger at the end of it, where, having pierced it, they fit into it a small narrow bit of iron about one palmo long. Then seated in the passages or works, as the veins prove, they pick out and remove the ore, which having been crushed by a stout rock in certain large receptacles fixed firmly in the ground, and with other smaller stones by hand, and having reduced the ore to powder, they carry it to the washing-places." The gold was then obtained by repeated washings and crushings. Under Quirante's directions 26 assays of the ore taken from the old workings were made. Worcester [*This Journal* (1906), 1, 848] says of the gold mining of the Lepanto-Igorots: "The men have mined gold for centuries. They work over the faces of exposed cliffs, when necessary suspending themselves by means of rattans, and pick out the streaks of rich ore which show free gold. This they dig with their crude iron or steel implements, the use of powder being unknown among them. The ore, after being dug, is crushed and panned. Both men and women also wash gold from the sands of the streams, and the women are especially famed for the skill with which they save the very light float gold—a skill which American miners have found it impossible to attain. The gold is usually sold in the form of dust, although it is sometimes melted and run into ingots."

color. He was much surprised at that and told it immediately to his companion. The latter, on seeing the hands of the former, was also surprised, and they both stood looking at it for some moments. After examining and studying it, they went home to get some wooden vessels. They returned to the abovesaid sitio, and gathered a big lump of unit. They performed the *dayas*, by which the saffron-colored substance is separated from the earth and sand. When the latter was separated from the former, the discoverers saw that the saffron-colored substance consisted of very small particles of dust, which when shaken in the abovesaid wooden vessels glittered brightly in the sun. One of the men continued to shake the particles in the wooden vessel for the purpose of studying them carefully, while the other was sitting beside a small fire warming himself. After some minutes of talk, they agreed to try to melt them in the fire. This they really did by placing a certain quantity of those particles in a bit of broken jar, which they set among the live coals. After a few hours they obtained the result they desired. On becoming cool, they had a substance with the abovesaid color. But it was mixed with other substances, which were probably impurities from the coal which was used to melt the particles, and which had united with the abovesaid particles at the moment of melting. That abovesaid substance they called *bulauan* or *dadaan*, according to the condition in which it was found in the soil and subsoil when it was obtained and corresponding to its color. They continued to experiment in order to ascertain its uses. After a few days had passed, the abovesaid agreed to convert it into a kind of earrings which they called *dinanpulay*. At the present time only the wealthy people wear them, because of their excessive value, because of the difficulty in finding them, and because of the great cost of manufacture. Those discoverers continued their undertaking and succeeded in making a number of earrings, which they took to other rancherías to sell, as well as some pieces to Tagudin (Ilocos Sur). There the purchasers had the material tested by experts before buying it. As a consequence, it obtained the name of *balitoc*.<sup>106</sup> From those times we have continued to work that enterprise without cessation in spite of the difficulty and costliness of the work, and in fact in the way in which it was done in those days.

#### SABANGAN <sup>107</sup>

The township of Sabangan has 6 barrios, as follows: Bonayan, Goyan, Ilagan, Pingad, Namatec, and Sabangan (native name, Bait). Its total population is 2,232, of whom 37 are Christians

Smith [*Journ. Geol.* (1913), 21, 59, 60] thinks that at least 1,000 pesos per month are panned by the people of the Philippines. A manuscript conserved in the Philippine Library is entitled *Noticia de los Ygorrotes, de sus pueblos, gentio, y minas de oro y de varias tentativas para su descubrimiento*. Although undated, this manuscript is of the nineteenth century. It is a compiled account of Spanish contact with the Igorots and is accompanied by a map.

<sup>106</sup> Balitoc, the Ilocano word for gold.

<sup>107</sup> For a description of Sabangan, or Sabañgan, as it is sometimes written, see Perez, Igorrotes, 195-201. It is located 27 kilometers east of Cervantes.

and the rest Igorots. The inhabitants of Bonayan claim descent from Bintua and Olimen, a brother and sister, the only two people left alive "after the big flood." "A she hog from Pidipid strayed over to the place now called Bonayan and there had young ones. When the owners and others went after her they saw that the place was very fertile and well adapted for planting and good pasture for their live stock." The barrio of Ilagan was formed by the inhabitants of a place called Talo, who migrated en masse because of "the frequent visits of their neighbors, who were their enemies." The barrio of Pingad lays claim to great antiquity and size. During the Spanish régime, however, many of its inhabitants moved to other barrios. The barrio of Namatec was formerly located nearer the river, "but for protection from their more savage neighbors they moved \* \* \* higher up the mountain." The population of this barrio is decreasing. Various legends and customs of the township are described as follows:

#### LEGEND OF THE ORIGIN OF THE WORLD

In ancient times the earth was flat. When Lomaog (God) saw that on the earth all his people and every other living thing were mixed together, He said, "It is better that I make the earth float on water so that it could be inundated and the new creation that will come after will be more scattered and separated." A big flood came and destroyed every living thing except two people, who were brother and sister—Bintua, the brother, and Olimen, the sister. This brother and sister married each other and they had many descendants who are now scattered all over the earth.<sup>108</sup>

#### CAÑAO

The cañao is a sacrifice of chickens, hogs, and all other kinds of animals, offered to Lomaog (God), that he may give them good health, better crops, and a better increase from their live stock.

#### MARRIAGE CEREMONY

At sunset, after supper, the young women go to their tribunal to sleep and the young men go to theirs. Late at night the young men go to the tribunal where the girls are sleeping, and the young man that wishes to get married speaks with the girl of his choice; then if the girl is willing she tells the young man to go and bring firewood to her father's house, and she takes *binobodan*<sup>109</sup> (a native drink made out of rice) and rice to the house of the young man's father. In this manner their parents know that their son and daughter wish to marry. Then the parents of both the young people agree that the young man shall go to the house

<sup>108</sup> See Blair and Robertson, *ut supra*, 5, 125-129, for the story regarding the separation and origin of different nations.

<sup>109</sup> Rather the rice that is left after tapuy is made, although here the word may be used as a synonym for tapuy. It is said to be more intoxicating than tapuy.



where the girl lives and there they have a cañao, for which they kill a chicken; three days later they have another cañao for which they kill a suckling pig, and after this cañao they become man and wife. After they have been living together for one year they have a cañao again for which they kill 3 or 4 hogs, at the third day of this cañao they kill a suckling pig, thus signifying that the cañao is over. After being married five years and after they have acquired a little property, they have another cañao, for which they prepare beforehand plenty of binobodan. Preparations for this cañao are commenced seven days before the date of the cañao; the day before the cañao they repair the roof of their house and bring in plenty of firewood. The day after all these preparations are completed the parents and relatives of both gather together there; then they kill a carabao and prepare food for all the people. In the meantime they send after all their relatives living in other towns. After all their relatives and visitors have arrived, the man and his wife erect in front of their house 4 pieces of wood; the pieces of wood are tied together at the top and spread out at the bottom; they kill a hog and roast it between these 4 pieces of wood; after it is roasted they cut the head off and place it on a little platform, which is fixed between these pieces of wood, about halfway up; this arrangement is called *bansa*. The married couple then dances the bansa, the man holding a basket while the woman scatters rice around it and in front of the house. The relatives and guests then make presents to the married couple, such as money, rice, or anything else that they wish to give. After this last ceremony is over, all the people are allowed to dance and sing as they please.

#### CAÑAO FOR THE SICK AND THE DEAD

When a person gets sick, a cañao is made for him, for which a chicken or a hog is killed, which serves as treatment for his or her sickness.

When a person dies, all the relatives of other towns are sent for. The dead are either buried early in the morning or late in the evening; the parents and relatives have a cañao for which a chicken is killed. Five days after the burial, all the people participating in this cañao go to the river and take a bath; for this occasion a chicken is killed over which a prayer is offered up for the soul of the dead. A year after, the parents and relatives of the dead person have one more cañao for which a she hog and 3 suckling pigs are killed. After this ceremony, the mourning for the dead is over.<sup>110</sup>

<sup>110</sup> The death-cañao described above is for the poor people. If the dead person is a rich Igorot, the cañao will last as long as there are any animals left to be killed. When about all the animals are killed, some old woman goes into a trance and while in that state pretends to see the man sitting along the mountain side, all tired out and unable to go any farther. She will communicate this to the relatives of the dead person, and they will immediately procure a horse and kill it in order that the dead man may have a horse to ride and in that manner reach his destination. During all this time the dead person is placed in a sitting posture, tied in a chair, raised up from the ground 4 or 5 feet. Under the chair a smouldering fire is built, thereby preserving the body. This lasts sometimes ten or twelve days, according to the number of animals to be killed.—W. A. MILLER. See also footnote 79.

## MATERIAL OUT OF WHICH CLOTHES WERE MADE

The ancient people used G strings made out of pounded tree bark and basket-shaped hats woven out of *bical* (a wild bamboo). The *pingad* worn by the women was also made out of tree bark, pounded, finely twisted, and then woven into a cloth. (The *pingad* is a narrow blanket about 2 feet wide and long enough to reach around a woman's waist.)<sup>111</sup>

## MANNER OF SETTLING COMPLAINTS

When a person has a complaint to make against anyone, all the old men of the community are called together, and the complainant states the nature of his complaint to them. They then send after the accused, and upon his arrival the complainant is asked to state his complaint before the accused; the accused then is allowed to make his statement; if neither party has any witnesses, the old men stick a fine needle in the top of their heads (complainant and accused) and he that bleeds loses the case. Another way: They make the complainant and the accused throw stones at each other and he that is not hit wins the case. Another way: They give to the complainant and to the accused [each] a small chicken, hatched by the same hen. Each one roasts his chicken before an open fire, without cleaning it, or taking the feathers off. When they are roasted they are cut into before the old men and he, the gall of whose chicken is the smallest, loses the case.<sup>112</sup>

## CAÑAO FOR PLANTING AND HARVESTING

At the time for planting rice in seed beds, all the people in the community have a common cañao for which everybody kills a chicken. Before they begin to transplant their rice, they have the same kind of a cañao; also, when the planting is over. For ten days before the rice cutting commences, nobody is allowed to leave the town; during this time they have a cañao for which they kill hogs and chickens; after the ten days' cañao is over, one of the old men goes under a big tree (the sacred tree of the community) and there he sacrifices a chicken and offers up a prayer, and after this ceremony the rice cutting begins. After the rice is all cut, another cañao is held.<sup>113</sup>

After camote planting is over, every man in the community goes, with his spear and shield, to the mountains, and there calls in a loud and suppliant voice for the souls of the dead to come in. Upon their return to the town they go directly to their tribunals. Then an old man from each tribunal goes to get water and a spear and places them, while offering up a prayer, in front of his tribunal. The next day they kill a dog and place it in front of the tribunal and there they leave it as food for the spirits they have thus summoned.

When a cañao is about to commence all the paths and streets leading into the town are closed with brush and thorns in order that no one from another town may enter.

<sup>111</sup> See footnotes 26 and 49; and cf. Jenks, *Pub. P. I. Ethnol. Surv.* (1905), 1, 111-114.

<sup>112</sup> The first of the ordeals mentioned above is similar to the ordeal by pudong, described on page 518. Compare also page 512. See Jenks [*Pub. P. I. Ethnol. Surv.* (1905), 1, 169] for a description of the pudong.

<sup>113</sup> See footnote 28.

## SUPERSTITIONS

When a person commences to build a house and he sees a rat or a mouse, he discontinues his work, as that predicts bad luck.

After all materials needed to build a house are prepared and ready to start the work, all the people of the community come to help; but after the house is built, if the owner sees a crow, a mouse, or a snake, he at once moves the house into another *solar* or lot. When his house is once more built, if he sees no more of these animals, he holds a three days' cañao, for which at first a chicken is killed and then some hogs. After all these ceremonies are over, if the owner has no bad dream or sees no bad omen, he will then inhabit the house. If within three days he sees or hears nothing, he holds another cañao of chicken, but if he sees anything that predicts bad luck, or has a bad dream, he leaves the house forever and finds himself another place to live.

The barrio of Sabangan is the central barrio of the township and when the Spaniards first came to this country they established their headquarters for the guardia civil there.

This document is made out by the presidente of the township together with the secretary, due to the fact that the teniente of the barrio, the old men, and the old women do not know how to read or write.

This document of information is signed by the presidente and the old men of the community who were all present, and is dated this date (July 6, 1911).

SAN EMILIO <sup>114</sup>

No legends or customs are related of this township. It is comprised of the following barrios, each of which is divided into two or more parts: San Emilio, Tiagan, Baang, Lancuas, Kalumsing, Sibsibu, Paltoc, and Matibuey. Parts of the township belonged formerly to Abra subprovince and to Ilocos Sur Province. The names of the old sites inhabited by the people of the present territory of the municipality were Ampagadan, Baioes, Bago, Lipay, Batbatay, Batingco, Petredo, Gunnabec, Bising, Bangbagas, Nagbukel, Liang, Paracad, Pitocan, Laqueb, Bacongan, and Limpa, but these places were deserted because of sickness, in accordance with Igorot custom. Part of the known history dates back to 1829. In Spanish times, a garrison of 1 lieutenant, 1 sergeant, 1 corporal, and 12 soldiers was stationed in San Emilio. The Filipino soldiers of the revolution followed them, and then the American soldiers were stationed there until 1904. One friar was stationed there from 1890 to 1897. "In 1894, the comandante politico militar and the friar enforced baptism upon the people of the townships of San Emilio and Concepcion. All the people, youths and adults, with no exceptions, were baptized, but the customs of the Igorots, such

<sup>114</sup> For a description of San Emilio, see Perez, Igorrotes, 243, 244. It was formerly a part of the district of Bontoc.

as performing cañaos and other habits, had not been forbidden up to date; but since the revolution in the Philippines none of our children have been baptized; the only ones are the children of the original Christians who are now living in this township."<sup>115</sup>

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<sup>115</sup> Christianity has never obtained any great hold among the Igorots. In Lepanto, the work of the missionaries was carried on first from the mission of Cayan. Lillo de Gracia, Distrito de Lepanto, 17, says that the Igorots called all Christian Filipinos Ilocanos. The Christian population of the subprovince is found for the most part in Cervantes, Concepcion, and San Emilio [Census of the Philippine Islands. Washington (1905), 1].



## ILLUSTRATIONS

(Plates I and II are from photographs by Martin; Plate III is from a photograph by Worcester;  
Plates IV to IX are from photographs by Eveland.)

### PLATE I

- FIG. 1. Lepanto-Igorot woman.  
2. Lepanto-Igorot woman, showing tattooing.

### PLATE II

- FIG. 1. The ato at Sagada.  
2. Group of Igorots at Cervantes with a jar of tapuy.

### PLATE III

Burial place of Lepanto Igorots.

### PLATE IV. IGOROT COPPER SMELTING

- FIG. 1. First roasting.  
2. Completion of the roast.

### PLATE V. IGOROT COPPER SMELTING

- FIG. 1. Clearing the matte.  
2. Roasting the matte.

### PLATE VI

Old Spanish road to copper mines at Mancayan, showing contact between  
overlying quartz porphyry and Mancayan diorite.

### PLATE VII

Copper mines, Mancayan.

### PLATE VIII

Smelter site, Cantabro-Filipino Company, Mancayan.

### PLATE IX

Old native workings at Suyoc.

### TEXT FIGURE

- FIG. 1. Map of a part of Mountain Province, Luzon.





Fig. 1. Lepanto-Igorot woman.



Fig. 2. Lepanto-Igorot woman, showing tattooing.







Fig. 1. The ato at Sagada.



Fig. 2. Group of Igorots at Cervantes with a jar of tapuy.

PLATE II.



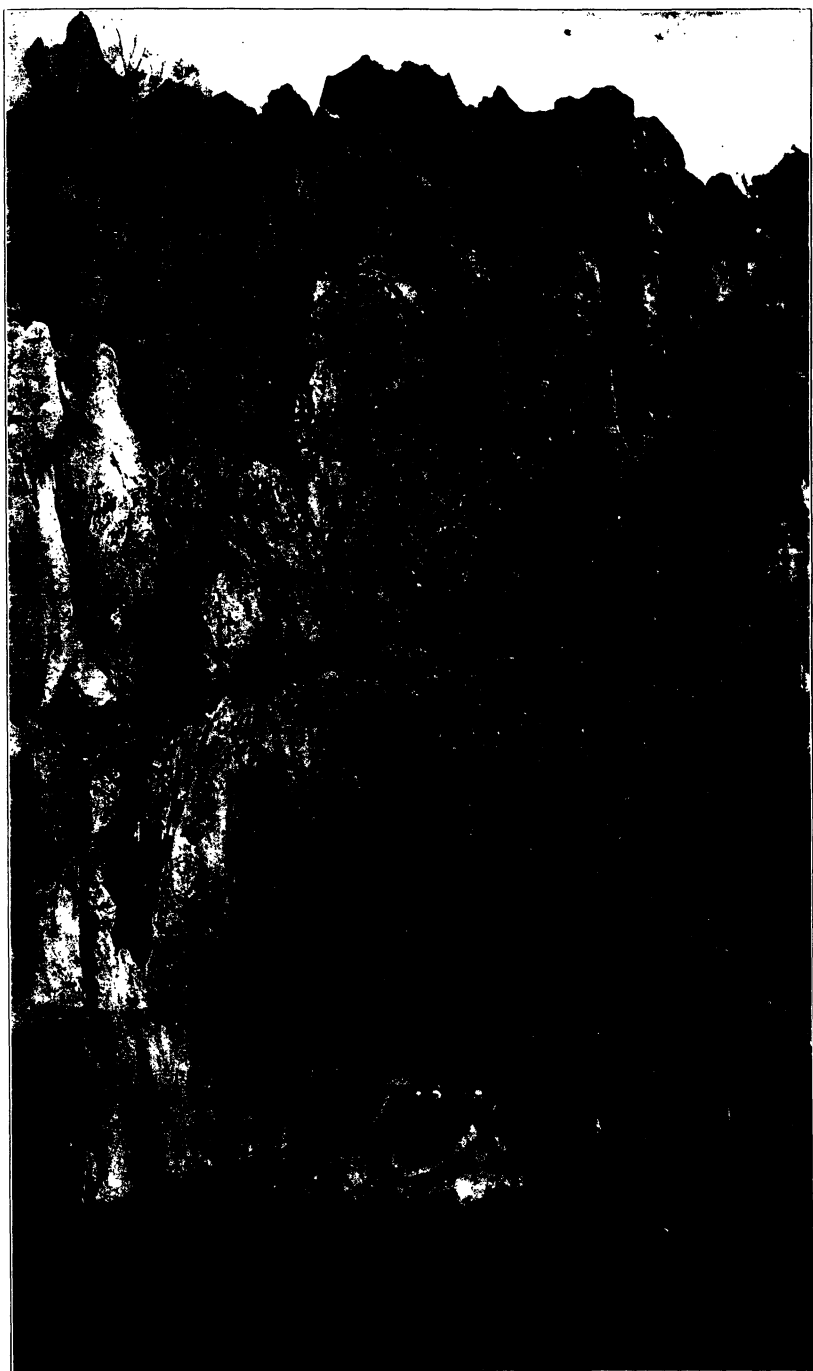


PLATE III. BURIAL PLACE OF LEPANTO IGOROTS.





Fig. 1. First roasting.



Fig. 2. Completion of roast.

PLATE IV. IGOROT COPPER SMELTING.





Fig. 1. Clearing the matte.



Fig. 2. Roasting the matte.

PLATE V. IGOROT COPPER SMELTING.





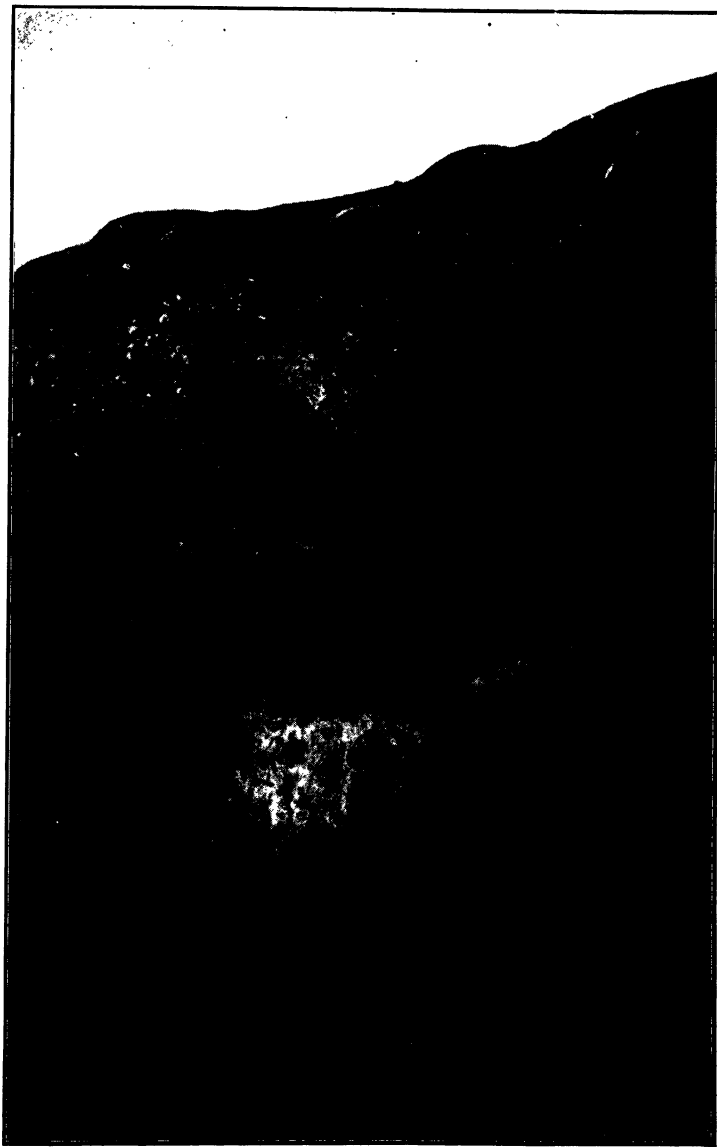


PLATE VI. OLD SPANISH ROAD TO COPPER MINES, MANCAYAN, SHOWING  
CONTACT BETWEEN OVERLYING QUARTZ PORPHYRY AND MANCAYAN  
DIORITE.



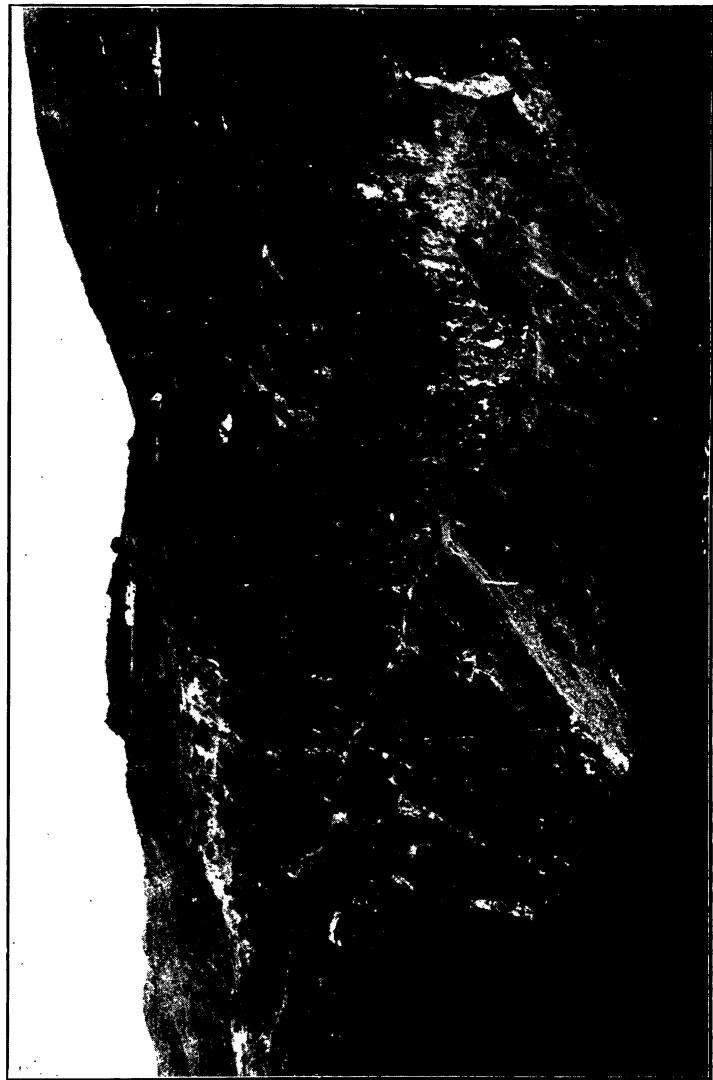


PLATE VII. COPPER MINES, MANCAYAN.



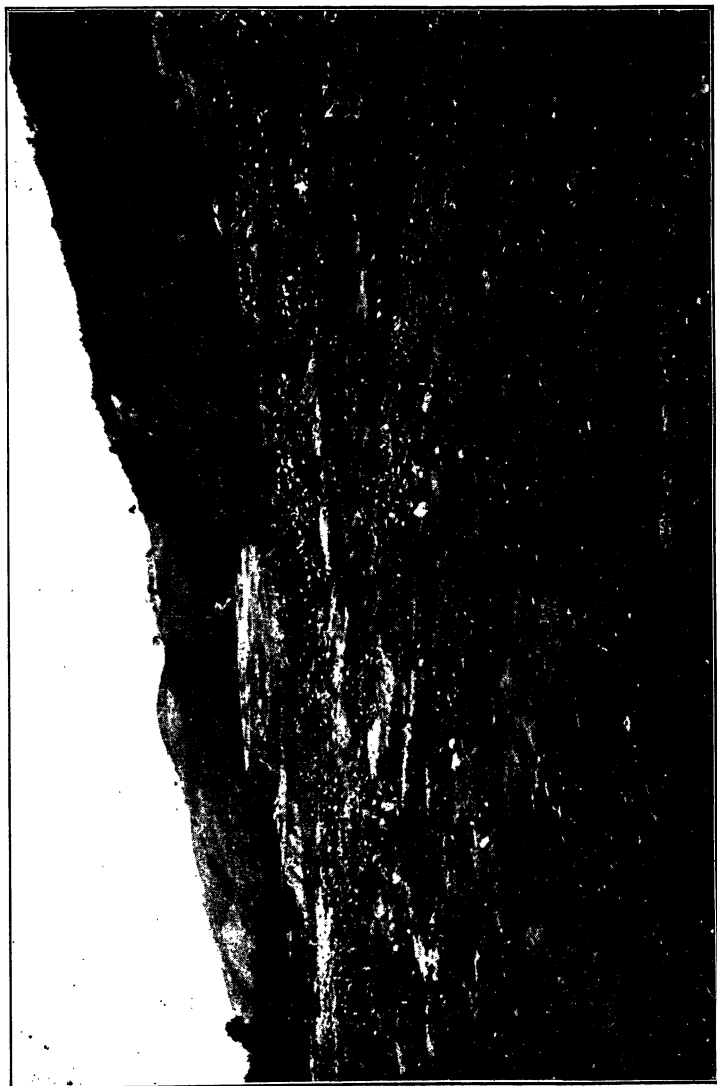


PLATE VIII. SMELTER SITE, CANTABRO-FILIPINO COMPANY, MANCAYAN.





PLATE IX. OLD NATIVE WORKINGS AT SUYOC.





DESCRIPTION OF A NEW SPECIES OF PRIONOCHILUS FROM  
THE HIGHLANDS OF LUZON

By RICHARD C. MCGREGOR

(From the Section of Ornithology and Taxidermy, Biological Laboratory,  
Bureau of Science, Manila, P. I.)

One colored plate

*Prionochilus anthonyi* sp. nov.

*Specific characters.*—Top of head with a conspicuous yellow patch; remainder of upper parts glossy black; chin and throat white; remainder of under parts yellow; under tail-coverts cadmium yellow.

*Type.*—No. 7515, ♂, Bureau of Science collection. Polis Mountain, Ifugao subprovince, Luzon, P. I. Collected February 7, 1913, by R. C. McGregor and A. Celestino.

*Description of type.*—Forehead, lores, circumocular region, and auriculars black with very little gloss; crown and occiput cadmium yellow; neck, back, rump, upper tail-coverts and median and lesser wing-coverts black glossed with dusky dull bluish green; primaries and their coverts, secondaries and their greater coverts, and rectrices fuscous to chaetura black; edge of wing, wing-lining, axillars, and inner edges of primaries white; chin, throat, and malar region white; remainder of under parts green or yellow; sides of breast citrine, becoming more yellowish on flanks; middle of breast and abdomen empire yellow; under tail-coverts cadmium yellow. Iris brown; bill black; legs, feet, and nails blackish slate; soles pale yellow. Length in flesh, 106 mm.; wing, 56; tail, 29; tarsus, 16.

*Remarks.*—*Prionochilus anthonyi* does not resemble any other Philippine species of the genus and appears to differ from all other described species in pattern of coloration. The bill is similar in proportions to that of *P. quadricolor* Tweeddale, but is very much larger. The bill is much stouter than in *P. johannæ* Sharpe. The type and only specimen was collected in the mossy forest near the summit of the Government trail between Banaue and Bontoc, within a few meters of the rest house on the Banaue side. The elevation of the rest house is about 2,000 meters. The species is named for Alfred Webster Anthony.



## ILLUSTRATION

PLATE I. *Prionochilus anthonyi* sp. nov. (Drawn and colored from the type by T. Espinosa.)





PLATE I. PRIONOCHILUS ANTHONYI SP. NOV.



## NITIDULIDÆ DES PHILIPPINES RECOLTÉS PAR C. F. BAKER<sup>1</sup>

Par A. GROUVELLE

(Paris, France)

### *Brachypeplus ornatus* sp. nov.

Ovatus, abdominis apice acuminatus, modicissime convexus, nitidulus, tenue flavo-pubescens, capite, prothorace abdomineque rufo-testaceus, elytris ochraceo-testaceus; capite vix infuscato, prothoracis margine postico medio, elytrorum lateribus apiceque, abdominis segmentorum disco nigris. Antennae breves; clava paulo longiore quam latiore, apice breve et obtuse acuminato-pulvinata; articulis 7° et 8° praecipue ultimo valde transversis. Caput transversum, subdepressum, crebre punctulatum, ante antennarum bases sat productum, subtruncatum; temporibus minutis, acutis. Prothorax valde transversus antice quam postice vix angustior, lateribus rotundatus; angulis anticis posticisque obtusis, vix hebetatis; basi truncata, utrinque scutelli vix perspicue breveque sinuata, tenuiter marginata. Scutellum subsemicirculare, tenuissime punctulatum. Elytra paulo breviora quam simul latiora, tenuiter punctato-striata; striarum intervallis unilineato-punctatis; striis integris. Abdominis segmentum ultimum apice obtuse acuminatum.

Long., 4 mm.

LUZON, Laguna, Los Baños (2 individus).

Ovale, abacuminé vers le sommet de l'abdomen, un peu plus de deux fois plus long que large dans sa plus grande largeur; très faiblement convexe, brillant, couvert d'une fine pubescence flave, médiocrement visible, roux testacé sur la tête, le prothorax et l'abdomen, testacé-jaunâtre sur les élytres; marge antérieure de la tête rougeâtre, tête à peine enfumée; milieu de la marge postérieure du prothorax, marges latérales et épipleures des élytres et milieu des segments de l'abdomen noirs. Antennes courtes, massue noirâtre; 1<sup>er</sup> article épais, un peu plus long que large, 2<sup>e</sup> moins épais, une fois et demie plus long que large, 3<sup>e</sup> grêle, 4<sup>e</sup> à peine allongé, 5<sup>e</sup> et 6<sup>e</sup> subtransversaux, 7<sup>e</sup> et 8<sup>e</sup> (8<sup>e</sup> surtout) très transversaux, le 8<sup>e</sup> plus large que le 7<sup>e</sup>; 9<sup>e</sup> et 11<sup>e</sup> formant une massue brusque, un peu plus longue que large, dont

<sup>1</sup> Proof read by C. F. Baker.



le dernier article, un peu plus long que les deux premiers, est terminé par un bouton conique, émoussé, surbaissé. Tête moins de deux fois plus longue que large, subdéprimée, rétrécie transversalement en avant des bases des antennes; épistome assez saillant, parallèle, subtronqué en avant; front très densément pointillé, faiblement impressionné en avant des bases des antennes, de chaque côté de l'épistome; épistome presque lisse yeux échancrant les marges du front, médiocrement saillants, à très petites facettes; tempes petites, anguleuses; labre environ quatre fois plus large que long. Prothorax tronqué en avant, à peine plus étroit en avant qu'à la base, arrondi sur les côtés, environ deux fois  $\frac{1}{4}$  plus long que large dans sa plus grande largeur, très densément pointillé, un peu plus fortement sur les marges latérales; angles antérieurs et postérieurs obtus, à peine émoussés; côtés finement rebordés; base tronquée, brièvement sinuée de chaque côté de l'écusson, très finement rebordée. Ecusson presque en forme de demi-cercle, finement et très densément pointillé. Elytres tronquées à la base, arrondis aux épaules, subparallèles, arrondis aux angles postérieurs-externes, séparément et très largement arrondis au sommet, un peu moins longs que larges ensemble, finement ponctués-striés; stries entières; intervalles larges, chacun avec une ligne de points beaucoup plus larges que les stries; calus huméraux marqués; marges latérales fortement déclives, très étroitement rebordées. Segments apparents de l'abdomen très densément pointillés; dessous roux testacé, glabre; 1<sup>er</sup> et 2<sup>e</sup> segment (1<sup>er</sup> mesuré entre la hanche et le sommet) subégaux, plus courts que le 3<sup>e</sup>, 5<sup>e</sup> presque aussi long que 3<sup>e</sup> et 4<sup>e</sup> réunis.

*Amystrops bakeri* sp. nov.

Breviter oblongus, convexiusculus, nitidulus, tenuissime flavo-pubescens, ferrugineus, creberrime tenuissimeque punctulatus. Antennae fere breves; 1<sup>o</sup> articulo incrassato, intus valde rotundato-producto, clava paulo longiore quam latiore, articulis haud densatis. Caput transversissimum, subdepressum, antice sinuatum, dense punctulatum; oculis productis, temporibus haud indicatis, lateribus retrorsum valde convergentibus. Prothorax transversissimus, antice valde angustatus; margine antico medio truncato, utrinque antrorsum late subanguloso-producto; lateribus arcuatis, juxta basin parallelis, praecipue ad basin sat late concavo-explanatis; angulis posticis acutis, retrorsum productis; basi medio subsinuata, utrinque ante angulos posticos subtruncata. Scutellum triangulare, transversissimum. Elytra humeris

rotundata, lateribus arcuata, vix ampliata, apice subtruncata, breviora quam simul in maxima latitudine latiora; elytrorum angulis suturalibus breviter rotundatis. Pygidium apice rotundato-acuminatum.

Long., 2.3 mm.

LUZON, Laguna, Los Baños (2 individus).

Oblong, environ une fois et demie plus long que large dans sa plus grande largeur, médiocrement convexe, couvert d'une pubescence flave, à peine visible, ferrugineux, faiblement brillant, très densément et très finement pointillé, sauf sur la tête. Antennes presque courtes; 1<sup>er</sup> article fortement dilaté, arrondi en dedans, à peine plus long que large, 2<sup>e</sup> à peine épaissi par rapport au 3<sup>e</sup>, un peu plus long que large; 3<sup>e</sup> moins d'une fois et demie plus long que large, 4<sup>e</sup> et 5<sup>e</sup> subcarrés, 6<sup>e</sup> un peu transversal, 7<sup>e</sup> encore plus, 8<sup>e</sup> très court et plus large que les précédents; 9<sup>e</sup> à 11<sup>e</sup> formant une massue très accentuée, un peu plus longue que large, légèrement atténuée vers l'extrémité, à articles faiblement séparés dont le 2<sup>e</sup> article est un peu plus court que le 1<sup>er</sup> et assez nettement plus court que le 3<sup>e</sup>, ce dernier terminé par un bouton conique très surbaissé. Tête beaucoup plus de deux fois plus large que longue, subdéprimée, densément pointillée, impressionnée de chaque côté vers la naissance de l'antenne; bords latéraux fortement convergents en arrière avant les yeux, sinués en avant pour l'insertion des antennes; épistome parallèle, faiblement sinué en avant; labre bien visible, arrondi aux angles antérieurs, sinué au milieu de sa marge apicale; yeux très saillants; tempes nulles. Prothorax très rétréci en avant, arrondi sur les côtés, subparallèle à la base, environ deux fois et  $\frac{1}{3}$  plus large à la base que long; bord antérieur tronqué au milieu, saillant en avant, de chaque côté, en formant un lobe anguleux émoussé; côtés bordés par un fin bourrelet et par une marge concave plutôt étroite en avant, dilatée sur la région des angles postérieurs; ceux-ci aigus, un peu saillants en arrière; base largement subsinuée au milieu, presque tronqué de chaque côté de cette sinuosité; ponctuation dessinant presque des strigosités transversales. Ecusson triangulaire, plus de deux fois plus large à la base que long. Elytres sinués à la base de chaque côté de l'écusson, arrondis aux épaules, arqués sur les côtés, à peine élargis, presque tronqués ensemble au sommet, nettement moins longs que larges ensemble; angles suturaux brèvement arrondis; marges latérales bordées par un fin bourrelet effacé vers le sommet et par une marge concave plus large à la base que celle du prothorax en avant, s'effaçant vers l'extrémité de l'élytre, se raccordant avec le disque de

l'élytre par une partie en pente assez inclinée; calus huméraux assez marqués. Pygidium déprimé, émoussé à l'extrémité, densément et finement pubescent. Pygidium du mâle tronqué, complété par un segment supplémentaire triangulaire, émoussé au sommet.

*Haptoneus latior* sp. nov.

♂ : Breviter ovatus, ad apicem attenuatus, convexus, nitidus, vix perspicue flavo-pubescent, ferrugineo-testaceus. Antennarum primum articulum intus rotundato-dilatatum, tam elongatum quam latum; clava sesquilogior quam latior. Caput transversissimum occipite convexum, fronte subdepressum, antice modice sinuatum, tenuissime et parce punctulatum; oculis prominulis, temporibus minutissimis acutis. Prothorax transversissimus, antice valde angustatus, tenuiter parceque punctulatus; margine antico medio truncato, utrinque antrorsum late et modice rotundato-producto; lateribus arcuatis, fere stricte explanato-marginatis; angulis posticis acutis, hebetatis, retrorsum leviter productis; basi ante scutellum et utrinque inter scutellum et angulos porticos subsinuata. Scutellum triangulare, basi duplo latius quam longius, vix perspicue punctulatum. Elytra basi quam prothorax paulo angustiora, humeris obtuse angulosa, apicem versus arcuatim angustata, apice fere conjunctim truncata, breviora quam simul basi latiora, subdense punctulata, lateribus latius quam prothorax explanato-marginata. Pygidium depressum, apice breviter rotundatum. Tibiae intermediae posticaeque maris circiter ad medium dilatatae.

Long., 1.7 mm.

LUZON, Laguna, Los Baños (1 individu).

Ovale, atténué vers l'extrémité du corps, environ une fois et un tiers plus long que large dans sa plus grande largeur, assez convexe, brillant, à peine visiblement pubescent, d'un testacé ferrugineux. Antennes médiocrement longues; 1<sup>er</sup> article épais, fortement arrondi en dedans, environ aussi long que large, 2<sup>e</sup> un peu épais, moins d'une fois et demie plus long que large, 3<sup>e</sup> à 8<sup>e</sup> progressivement un peu plus larges, 3<sup>e</sup> environ une fois et demie plus long que large, 4<sup>e</sup> et 5<sup>e</sup> subcarrés, 6<sup>e</sup> à 8<sup>e</sup> progressivement plus transversaux, 9<sup>e</sup> à 11<sup>e</sup> formant une massue compacte, environ une fois et demie plus longue que large, dont le premier article presque en forme de demi-sphère est plus long que les deux autres, et dont le dernier un peu plus étroit que le précédent est terminé par un bouton subconique, très surbaissé. Tête environ deux fois plus large que longue, se rétrécissant fortement en avant et en arrière des yeux, convexe sur l'occiput, subdépri-

mée sur le front, brèvement et transversalement rétrécie entre le bord antérieur de l'oeil et l'insertion de l'antenne, peu saillante en avant de celle-ci, légèrement sinuée au bord antérieur, couverte d'une ponctuation extrêmement fine et éparse; yeux échancrant modérément les marges du front, saillants, tempes très petites, aigües. Prothorax très rétréci en avant, presque parallèle à la base, arrondi sur les côtés, environ deux fois plus long à la base que long, éparsément ponctué, mais un peu plus fortement que la tête; bord antérieur tronqué au milieu, modérément saillant en avant de chaque côté en lobe largement arrondi; côtés bordés par une marge concave presque étroite; angles postérieurs un peu saillants en arrière, émoussés; base subsinuée devant l'écusson et largement subsinuée de chaque côté entre l'écusson et l'extrémité. Ecusson triangulaire, deux fois plus large à la base que long, éparsément et à peine visiblement pointillé. Elytres un peu plus étroits à la base que le prothorax, en angle obtus aux épaules, arqués, atténués vers l'extrémité séparément et un peu obliquement tronqués au sommet, nettement moins longs que larges ensemble à la base, couverts d'une ponctuation assez dense plus forte que celle du prothorax, atténuée vers le sommet; bords latéraux bordés un peu plus largement que ceux du prothorax; marges latérales du disque brusquement déclives; calus huméraux à peine marqués. Tibias intermédiaires et postérieurs du mâle élargis dans la moitié apicale.

Appartient au groupe de *H. lotrolus* Er., mais taille plus grande et forme beaucoup plus large.

*Aphenolia bakeri* sp. nov.

*Oblonga*, modice convexa, nitidula, glabra, testaceo-ferruginea. Antennae modicissime elongatae; 1° articulo intus valde lobato-producto, clava sesquilongiore quam latiore, 2° articulo transversissimo, quam 1° et 3° paulo latiore. Caput transversum, convexiusculum, antice truncatum, dense punctulatum, utrinque ad antennae basin puncto notatum; oculis prominulis. Prothorax antice quam postice paulo angustior, lateribus praecipue ad basin arcuatus, vix perspicue undulatus, fere 2 et  $\frac{1}{3}$  latior in maxima latitudine quam longior; crebre punctulatus; margine antico medio truncato, utrinque oblique lateque modice producto; angulis anticis hebetatis, posticis obtusis, marginibus lateralibus antice modice, ante angulos late concavo-explanatis; basi truncata, vix perspicue marginata. Scutellum transversum, subtriangulare, crebre punctulatum. Elytra humeris rotundata, lateribus arcuata, parum ampliata, apice separatim sub-oblique truncata, 1 et  $\frac{1}{3}$  longiora quam simul in maxima latitudine latiora, crebre et

quam prothorax paulo validius punctata; lateribus stricte marginatis. Pygidium in maxima parte apertum, apice acuminatum, crebre punctulatum.

Long., 3 mm.

LUZON, Laguna, Los Baños (1 individu).

Oblong, un peu plus de deux fois et demie plus long que large dans sa plus grande largeur, modérément convexe, un peu brillant, glabre, testacé-ferrugineux. Antennes médiocrement allongées; 1<sup>er</sup> article dilaté en dedans en lobe arrondi; 2<sup>e</sup> un peu épais, environ une fois et demie plus long que large; 3<sup>e</sup> grêle, plus d'une fois et demie plus long que large; 4<sup>e</sup> à 8<sup>e</sup> progressivement un peu plus épais; 4<sup>e</sup> et 5<sup>e</sup> subcarrés; 6<sup>e</sup> et 7<sup>e</sup> modérément transversaux, 8<sup>e</sup> nettement transversal; 9<sup>e</sup> à 11<sup>e</sup> formant une massue environ une fois et demie plus longue que large, dont le 2<sup>e</sup> article est très transversal et un peu plus large que les deux autres et dont le dernier est en majeure partie formé d'un bouton apical conique. Tête environ deux fois plus large que longue, rétrécie transversalement en avant des yeux, obliquement en arrière; épistome parallèle, tronquée au bord antérieur; occiput convexe, front subdéprimé, densément pointillé, marqué de chaque côté près de la base de l'antenne d'un point enfoncé; yeux échancrant modérément les marges latérales du front, présentant une saillie transversable subégale à la longueur du bord de l'orbite; labre profondément et étroitement incisé au milieu, environ quatre fois plus large à la base que long. Prothorax un peu plus rétréci en avant qu'à la base, arrondi, à peine ondulé sur les côtés, présentant sa plus grande largeur vers le premier quart de la longueur à partir de la base, environ deux fois et un tiers plus large dans sa plus grande largeur que long; bord antérieur assez brièvement tronqué dans le milieu, saillant un peu obliquement en avant de chaque côté, en formant un arc peu accentué et peu régulier; angles antérieurs obtus, émousses, postérieurs obtus; base tronquée, très finement et à peine visiblement rebordée. Bords latéraux bordés par une marge explanée concave, très modérément large, se développant sur la région des angles postérieurs, se raccordant en pente peu prononcée avec le disque; ponctuation fine très serrée. Ecusson subtriangulaire, transversal, très densément pointillé. Elytres tronqués à la base, brièvement arrondis aux épaules, arqués sur les côtés, très faiblement élargis, obliquement et séparément tronqués au sommet, environ une fois et un tiers plus longs que larges ensemble dans leur plus grande largeur, couverts d'une ponctuation très serrée, un peu plus forte que celle du prothorax; marges latérales étroi-

tement rebordées, raccordées avec le disque des élytres par une pente presque normale au plan de l'insecte; calus huméraux à peine marqués. Pygidium acuminé au sommet, en majeure partie découvert, un peu convexe, très densément et très finement ponctué.

*Cryptarcha bakeri* sp. nov.

♂ : Ovata, convexa, nitidula, tenuiter alutacea, pube flava in prothoracis marginibus anticis lateralibusque densata vestita, picea; margine antico capitis prothoracisque dilutior, in singulo elytro duabus maculis fuseo-rufis: 1<sup>a</sup> basilari, juxta callum humerale, 2<sup>a</sup> transversa, antrorsum arcuata, ultra medium, suturam subattingente. Antennae breves; clava sesquolongiore quam latiore, 1<sup>o</sup> articulo conico, transverso, 2<sup>o</sup> transversissimo, 3<sup>o</sup> transversissimo, sed quam 2<sup>o</sup> paulo angustiore, apice pulvino acuminato, valdissime depresso, terminato. Caput transversum, dense punctulatum; margine antico inflexo, subtruncato. Prothorax transversus, antice valde angustatus, dense punctulatus; margine antico late et haud profunde emarginato; angulis anticis antrorsum productis; lateribus arcuatis, juxta basin, ad apicem modice convergentibus; angulis posticis acutis, retrorsum productis; basi subtruncata, utrinque scutelli breviter sinuata. Scutellum transversissimum, apice late rotundatum, tenuissime alutaceum. Elytra fere sesquiongiora quam simul basi latiora, apice conjunctim rotundata, dense punctulata, punctis subasperis.

Long., 3.2 mm.

LUZON, Laguna, Los Baños (1 individu).

Ovale, environ deux fois et un tiers plus long que large dans sa plus grande largeur, convexe peu brillant, très finement alutacé, couvert d'une pubescence flave, plus allongée et plus dense sur le bord antérieur du prothorax et sur ses marges latérales, formant des bordures latérales beaucoup plus larges que la bordure antérieure; couleur brun de poix, plus claire sur le devant de la tête et vers les marges latérales du prothorax; sur chaque élytre deux taches d'un roux sombre: la 1<sup>re</sup> basilaire, suballongée, en dedans du calus huméral, la 2<sup>e</sup> au delà du milieu, transversale, arquée en avant, atteignant presque la suture et se continuant contre le bord latéral par une très étroite bordure atteignant le sommet. Antennes brun de poix clair, relativement courtes; 1<sup>er</sup> article plus épais, moins de deux fois plus long que large; 2<sup>o</sup> moins épais, environ une fois et demie plus long que large; 3<sup>o</sup> grêle environ aussi long que 3<sup>e</sup>; 4<sup>e</sup> et 5<sup>e</sup> subégaux, un peu allongés; 6<sup>e</sup> à 8<sup>e</sup> subcarrés; 9<sup>e</sup> à 11<sup>e</sup> formant une massue bien accentuée,

environ une fois et demie plus longue que large, dont le 1<sup>er</sup> article transversal est en forme de tronc de cône renversé, le 2<sup>e</sup> est très transversal et le 3<sup>e</sup> subégal au 2<sup>e</sup> mais un peu plus étroit et terminé par un bouton acuminé à peine saillant. Tête arrondie en avant, plus de deux fois plus large que longue, densément pointillée; marge antérieure infléchie, subtronquée; labre caché, yeux non saillants. Prothorax rétréci en avant, arrondi sur les côtés, légèrement rétréci vers l'avant, dans la partie basilaire, très nettement plus de deux fois plus large à la base que long, à peu près ponctué comme la tête; bord antérieur vu de dessous largement et peu profondément échancré, arrondi dans le milieu; angles antérieurs, vus de dessous, un peu aigus, saillants en avant, vus de face également aigus, finement rebordés comme les côtés; angles postérieurs saillants en arrière, vus de dessus un peu aigus, vus de face presque droits; base subtronquée en dedans des angles postérieurs, brièvement sinuée de chaque côté de l'écusson. Ecusson très transversal, largement arrondi au sommet, très finement alutacé. Elytres arqués à la base, en angles obtus, à peine émoussés aux épaules, rétrécis vers le sommet, arrondis ensemble à l'extrémité, brièvement déhiscents, couverts de points subrapeux, un peu plus forts et plus serrés à la base que ceux du prothorax, atténués vers le sommet; stries suturales effacées sur la moitié basilaire de la longueur. Pattes larges. Dernier segment de l'abdomen du mâle relevé dans la partie médiane de sa marge apicale; avant-dernier légèrement impressionné.

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[New names are printed in **heavy-faced type**; numbers in *italic* indicate synonyms or references of minor importance.]

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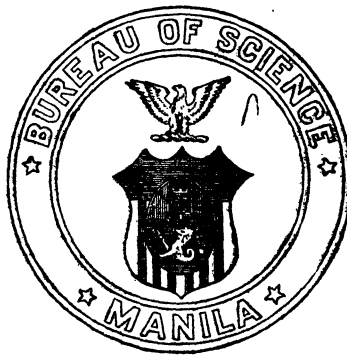
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